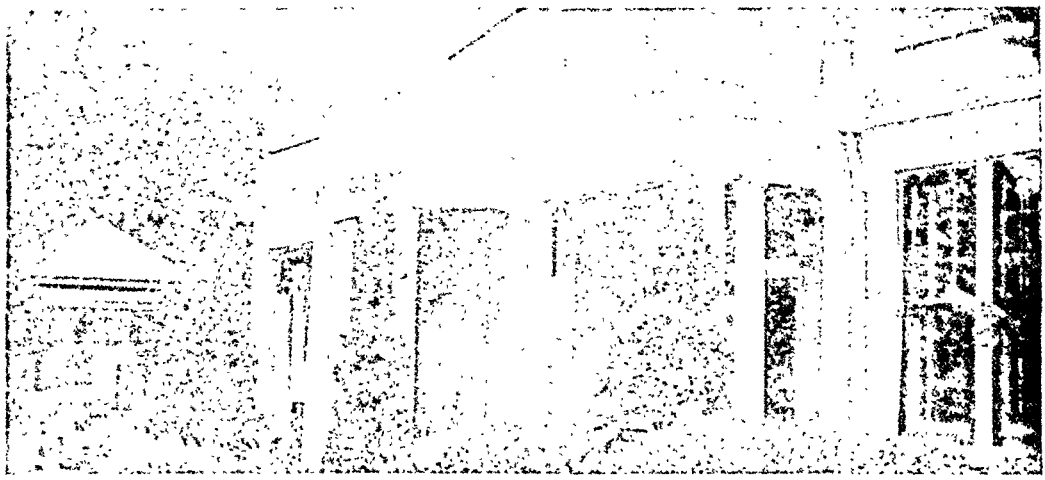

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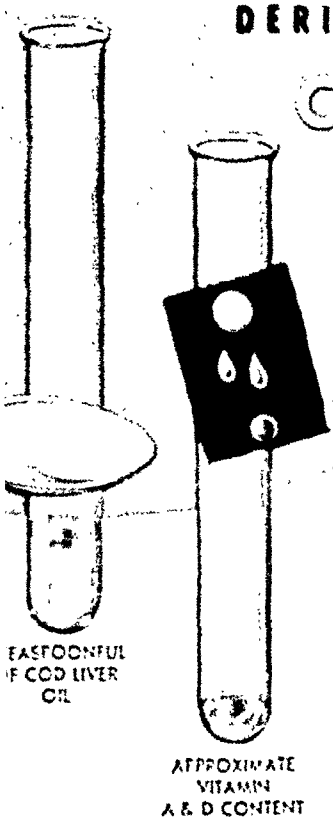

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CONTENTS:

Symposium on Bronchiectasis

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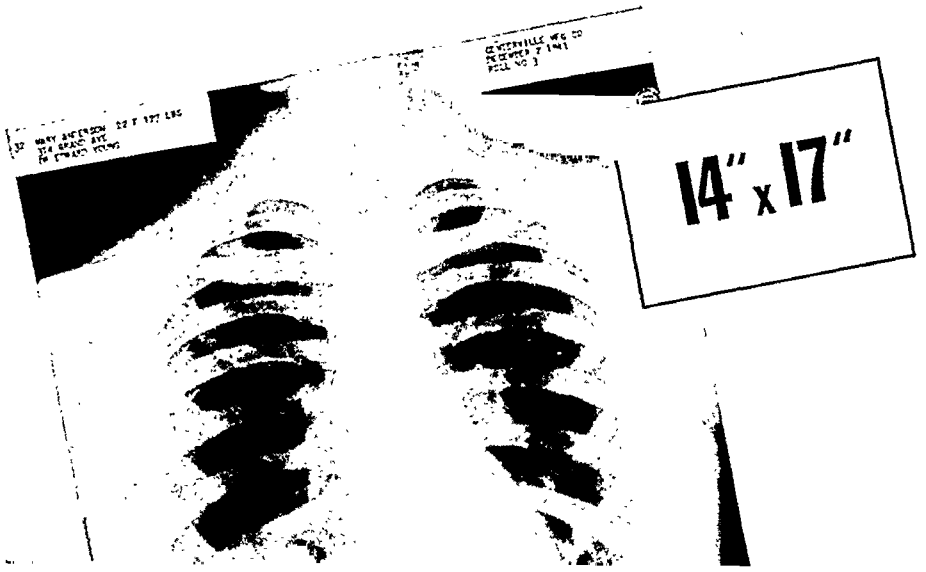

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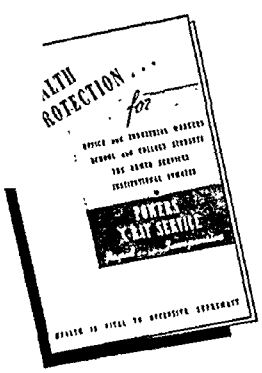

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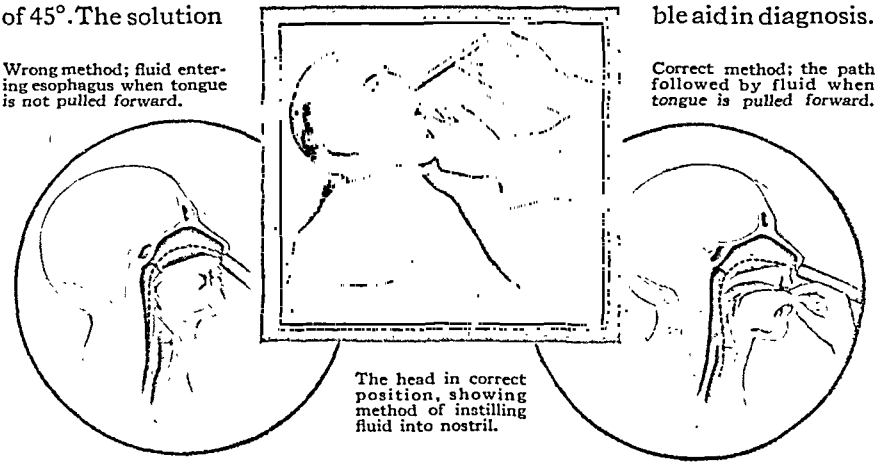

Wrong method; fluid entering esophagus when tongue is not pulled forward.

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*Forestier, J., and Leroux, L.: Simplified Method of Bronchography, Radiology 24:743-744 (June) 1935.

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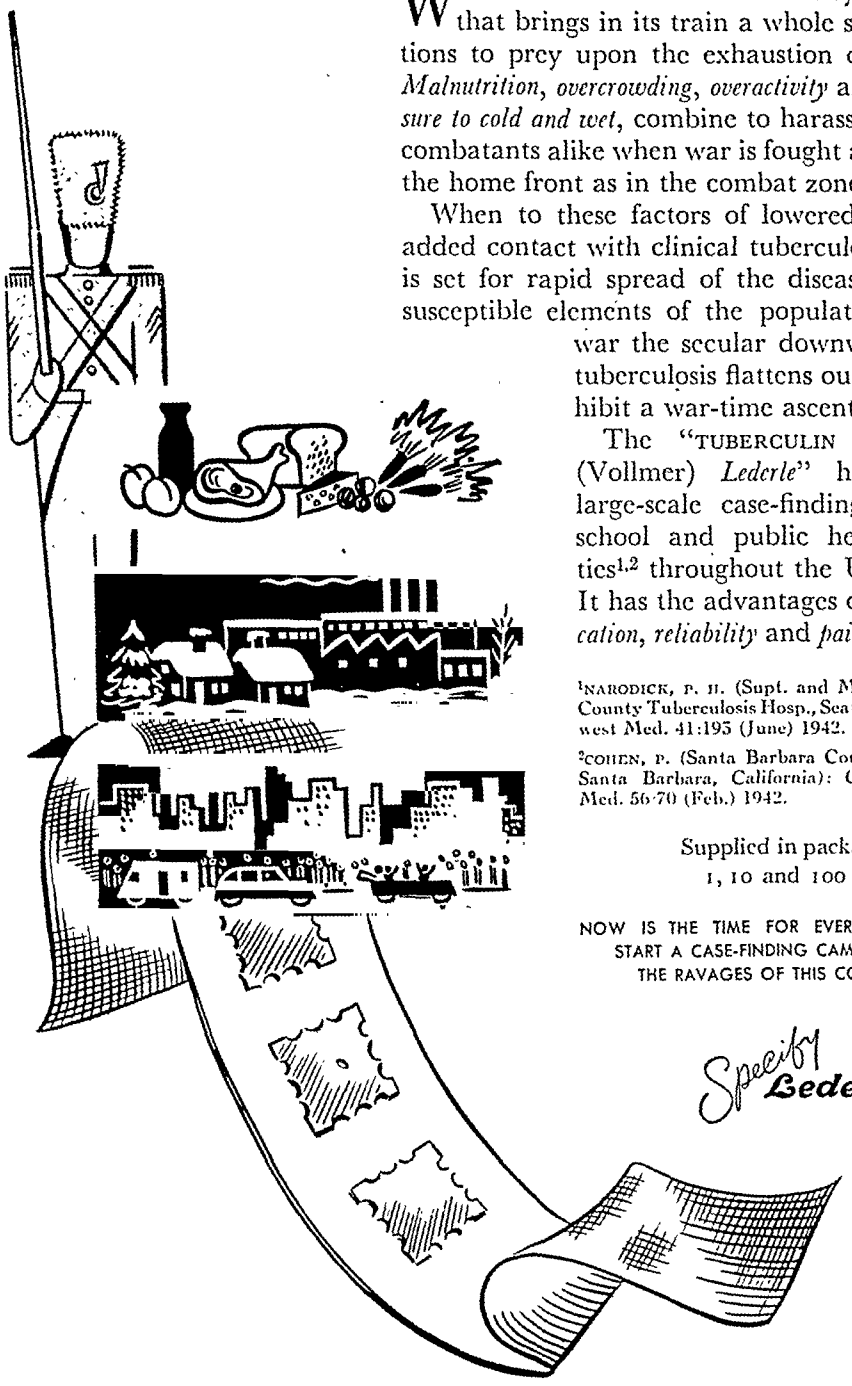

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[1]NARODICK, P. H. (Supt. and Med. Director, King County Tuberculosis Hosp., Seattle, Wash.): Northwest Med. 41:195 (June) 1942.

[2]COHEN, P. (Santa Barbara County Health Dept., Santa Barbara, California): California & West. Med. 56:70 (Feb.) 1942.

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DISEASES *of the* CHEST

VOLUME IX JANUARY-FEBRUARY, 1943 NUMBER 1

Introduction

BRONCHIECTASIS

Changing conceptions of bronchiectasis as a disease entity may be noted on almost every page of the following symposium. This is of utmost significance, since the disease has come to be accepted as the most common chronic disease of the chest, being even more prevalent than pulmonary tuberculosis. The purpose of this symposium is to call attention to the many new aspects of the etiology, the diagnosis, and the treatment of bronchiectasis. Thus, it is not without design that this symposium is published in the first issue of the revised journal, "Diseases of the Chest."

It was assumed originally that a symposium such as this would lead to the presentation of numerous controversial points. It will be noted that the original assumption is correct. Etiologic factors, such as sinusitis, considered as of primary importance a few years ago, are now regarded as only secondary in nature, adding to the morbidity of the disease rather than actually being important causes. Similarly, congenital malformations of the lung or bronchial tree, formerly considered as the cause of most bronchiectasis, are now mentioned only in passing as of etiologic importance.

Advances in an understanding of the pathogenesis of bronchiectasis have been no less comprehensive. The correlation between atelectasis and advanced bronchiectasis as demonstrated by case records and postmortem examinations has suggested the course of the morbid process. The demonstration of the relation of bronchial obstruction to bronchiectasis, noted first in cases of foreign bodies of long sojourn and subsequently by much clinical data, has shown the manner in which the disease may be produced. Of utmost significance is the fact that these clinical records have been duplicated experimentally, and the disease actually reproduced by experimental surgery.

The histologic picture of the advanced case, with the fibrotic lung, the destroyed bronchial epithelium and the loss of connective

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and elastic tissue elements in the bronchial lining has long been known. However, the recognition that the process is irreversible, once it has actually established itself, as well as the fact that a definite pre-bronchiectatic state does exist as a clinical entity are concepts which are relatively new, and have an all-important bearing on the study and management of the disease.

Improved diagnostic features have made us aware of the large numbers of patients suffering from bronchiectasis. Bronchography and bronchoscopy assume major roles in this phase of the problem. These diagnostic procedures are likewise of therapeutic importance both in aiding bronchopulmonary drainage and in accurately localizing areas of bronchial dilatation. Bronchography has long since passed the stage in which the oil is poured into the trachea blindly and allowed to seek its own path. The recognition of the segmental divisions of the lung has made it imperative that any lung mapping be a highly accurate procedure, clearly outlining the bronchi of all segments.

Undoubtedly the greatest change in the concept of bronchiectasis as a disease entity concerns its therapeutic management. Palliative procedures which in themselves have frequently led to an alleviation of symptoms have in a large measure given way to surgical extirpation of the lesion. This point is stressed by each author. Significantly, ten years ago it would probably have been the most controversial subject. Even now, however, chemotherapy, postural and bronchoscopic drainage, eradication of sinus and focal infections, and the removal of bronchial obstructions are all a part of any therapeutic regime; and in most cases of bilateral bronchiectasis must still be the limits of active therapy.

Finally, and, it would appear, most important of all is the recognition of the pre-bronchiectatic state. It is described in detail in this symposium as it occurs in children. It occurs in adults as well and as such is mentioned infrequently in the literature pertaining to bronchiectasis. Upon this phase of the subject should greatest stress be laid, for only through its recognition and prompt treatment can the long, debilitating disease process, with its associated social maladjustment, be avoided.

As previously mentioned, a critical review of the following papers shows numerous conflicting points, some of major significance. Differences of opinion by the various authors are stimulating and no effort is made to rationalize one with another. Each of the authors is outstanding in his particular field and his contribution represents his own clinical experience as well as his interpretation of the literature of his subject. Therefore, it is felt that it should be doubly important to allow these controversial points to remain as a basis for further investigative work.

RESUMEN

Distintos conceptos de la bronquiectasia como entidad mórbida pueden ser notados en casi cada página del siguiente acopio de articulos sobre el tema. Esto es de suma importancia, desde que la enfermedad ha llegado a ser aceptada como la más comun de las enfermedades crónicas del tórax, siendo aún mas frecuente que la tuberculosis pulmonar. El propósito de este symposium es llamar la atención sobre los muchos nuevos aspectos de la etiologia, el diagnóstico y el tratamiento. Es por eso que este symposium es publicado en el primer numero de la revista "Diseases of the Chest."

Como es de suponer, un symposium tal como el presente, llevaría a la presentación de numerosos puntos de controversia. Se notará que la presunción es correcta. Factores etiológicos tales como sinusitis, considerados como de importancia primaria hace algunos años, son ahora apreciados como de secundaria importancia y agregados a la enfermedad más bien que actuando como causas importantes. Del mismo modo, malformaciones congénitas del pulmón ó del arbol bronquial, anteriormente consideradas como la causa de la mayor parte de las bronquiectasias son ahora mencionadas solamente al pasar, y como de menor importancia.

Avances en la comprensión de la patogenia de las bronquiectasias han sido no menos considerables. La correlación entre atelectasia y bronquiectasia avanzada, demostrada por la observación clínica y los hallazgos de autopsias, ha sugerido el curso del proceso mórbido. La demostración de la relación entre obstrucción bronquial y bronquiectasia notada primero en casos de cuerpos extraños de larga permanencia y también por la observación clínica, ha mostrado la manera por la cual la enfermedad puede ser producida. Del mayor significado es el hecho que estos casos clínicos han sido comprobados experimentalmente y la enfermedad ha podido ser reproducida por medio de la cirugia experimental.

El cuadro histológico del caso avanzado, con fibrosis del pumón, el epitelio bronquial destruido y la pérdida de los elementos del tejido conectivo y elástico bronquial, es desde hace tiempo bien conocido. Sin embargo, el reconocimiento de que el proceso es irreversible una vez que se ha establecido, así como la existencia de un bien definido y diagnosticable estado pre-bronquiectásico, son conceptos relativamente nuevos en los que se basa la entitad mórbida.

El mejoramiento de los medios de diagnóstico nos ha permitido conocer el gran numero de pacientes que sufren de la enfermedad. La broncografía y la broncoscopía adquieren mayor importancia en esta fase del problema. Estos procedimientos diagnósticos tie-

nen igualmente importancia terapeútica al ayudar el drenaje broncopulmonar y localizar con precisión las zonas de dilatación bronquial. La broncografía ha pasado ya la época en la que el aceite se vertía en la tráquea ciegamente y se le dejaba buscar su propio camino. El reconocimiento de las divisiones segmentarias del pulmón ha hecho imprescindible su utilización para obtener un preciso perfil de las imágenes bronquiales en todos sus segmentos.

Indudablemente, el más grande cambio en el concepto de bronquiectasia como enfermedad corresponde al tratamiento. Los procedimientos paliativos, los cuales tan frecuentemente aliviaban los sintomas, han dado paso a la extirpación quirúrgica de la lesión. Este punto es destacado por cada autor. Sin duda, diez años antes hubiera sido el objeto de las mayores controversias. Aun hoy dia, sin embargo, la quimioterapia, el drenaje postural y broncoscopico, la extirpación de la infección focal y sinusal, y la supresión de las obstrucciones bronquiales, constituyen parte de cualquier régimen terapéutico; y en la mayoria de los casos de bronquiectasias bilaterales deben todavía ser los límites de una terapéutica activa.

Finalmente, lo que parecería de mayor importancia, es el reconocimiento del estado pre-bronquiectásico. En este symposium se le describe en detalle, tal como ocurre en la infancia. Tambien el mismo ocurre en adultos, y como tal, es mencionado relativamente poco en la literatura de la enfermedad. Esta fase del problema debería destacarse aún más por que es solamente a través de su reconocimiento y tratamiento, que este largo y debilitante proceso puede ser evitado.

Como ha sido mencionado previamente, una revista critica de los siguientes trabajos señalará numerosos puntos contradictorios, algunos del mayor significado. Las diferentes opiniones de los autores son estimulantes y ningún esfuerzo ha sido hecho para tratar de conciliarlas. Cada autor es una destacada personalidad en su materia, y su contribución representa su propia experiencia clínica, así como tambien su interpretación de la literatura sobre el tema. Por lo tanto, pareció doblemente importante dejar los puntos de controversia como bases para futuros trabajos de investigación.

Paul H. Holinger, M.D.
Chicago, Illinois

Present Concepts of Pathogenesis, Morbidity, Mortality and Treatment of Bronchiectasis

H. McLEOD RIGGINS, M.D.*
New York, New York

Although a sound pathological basis was laid for bronchiectasis by Laennec more than a century ago, precise knowledge of the etiology, bacteriology, pathogenesis, morbidity and mortality has accumulated only during the past fifteen or twenty years, largely since the first use of iodized oil in diagnostic bronchography by Sicard and Forestier. However, despite these significant advances, widely divergent opinions exist regarding many aspects of the disease. Some still emphasize its congenital nature. Mueller in 1928, and Ballon, Singer and Graham in 1931, and more recently, Miller and others have discussed the possibilities of congenital bronchiectasis. Perry and King, Warner, McNeil, Findlay, Riggins, and many others have expressed doubt regarding congenital bronchiectasis. Occasional writers continue to emphasize the role of spirochetes. However, the majority of investigators minimize their etiologic importance.

Of greater importance is the lack of uniformity in the treatment of bronchiectasis. In some clinics where large series of cases have been collected and carefully studied, a more unified and clear concept of the disease and its treatment is emerging. Nevertheless, wide divergence of opinion still exists as evidenced by reports in the literature by different specialists extolling various methods of therapy. These differences of opinion on the part of internist, roentgenologist, bronchoscopist and surgeon, obviously spring from a difference in understanding of the etiology, pathogenesis, pathology and pathological physiology, bacteriology, the varied clinical patterns, its usual course characterized by periodic remission and exacerbation of symptoms and often progression of the disease, if proper and adequate treatment is not rendered at the opportune time. Not infrequently, circumstance, patient and doctor contrive to overlook this opportune moment. Bronchiectasis is somewhat similar to pulmonary tuberculosis in that it tends to relapse and progress, and most cases of bronchiectasis, like most cases of tuberculosis, are potentially curable at some phase of the disease.

The internist who hopefully administers arsenicals or bismuth

*Department of Practice of Medicine, College of Ph and Surge Columbia University.

because of the erroneous concept that the spirochete is the most important bacteriological agent, lacks a comprehensive understanding of the great variety of micro-organisms which contribute to the etiology of the disease. The roentgenologist who enthusiastically gives roentgen therapy apparently fails to appreciate the pathological physiology, not only of the ectatic bronchi but also of the related lung disease. The bronchoscopist who weekly aspirates the stem bronchi or courageously does bronchoscopic lavage with some "bactericidal" agent for months or years, not only indulges in wishful thinking, but fails to visualize the dangers of flooding the lung, and the limitations of bronchoscopic aspiration and "bactericidal" solutions. The following case serves to illustrate:

G. L., male, aged thirty-four, was first seen in our clinic in 1934. He gave a history of having had bronchiectasis for seventeen years, and stated that during the preceding fourteen years he had been bronchoscoped "more than 200 times." His obvious desire to continue with a method of treatment which had had no definite beneficial influence on his disease was apparently because of the "reaction" to the cocaine which had been used throughout the years for local anesthesia before bronchoscopy. The patient eventually died of bronchopneumonia, having had bronchiectasis for over twenty years and having been bronchoscoped "more than 200 times." Somewhat similar cases can perhaps be cited from other clinics.

Now that an abundance of knowledge is available regarding the fundamentals and the natural course of the disease, a more unified opinion by the different specialists should crystalize and become a potent factor in the management of bronchiectasis. Too many patients with doubtful or definite bronchiectasis are still being treated with arsphenamine, bismuth or roentgen ray therapy and bronchoscopic aspiration and lavage. Such treatment not only fails to beneficially affect the bronchiectasis and related suppurative pneumonia, but are of themselves hazardous. Sufficient roentgen ray treatment may result in severe deleterious effects to the entire lung structure including the pleurae, the parenchyma, blood vessels and bronchi. A case report will be cited to illustrate the extremely deleterious effects of repeated roentgen ray treatment.

A discussion of the present concepts of etiology, bacteriology, pathogenesis, pathology and principles of treatment based on these fundamentals seems desirable. Sound management of bronchiectasis depends upon a comprehensive visualization of these fundamental principles, the various clinical patterns of the disease, its natural course, its obvious and potential hazards, the limitations of medical treatment, the curability of lobectomy or pneumonectomy and the morbidity and mortality of untreated, medically and surgically treated bronchiectasis.

ETIOLOGY AND PATHOGENESIS

It has previously been indicated that many theories have been advanced regarding the etiology and pathogenesis of bronchiectasis. While some writers still emphasize the congenital nature of the disease, the majority believe that bronchiectasis is usually acquired. Certain cases of congenital cystic disease of the lung may become infected and resemble bronchiectasis clinically and to a less degree as regards the gross pathology. In a large number of cases studied at Bellevue and Lenox Hill Hospitals during the past twelve years, no definitely proved case of congenital bronchiectasis has been seen by the writer.

Andrus and many others have emphasized the importance of physical forces resulting from collapse of the lung in the pathogenesis of bronchiectasis. Anspach, McNeil, Richards and others have pointed out that collapse of the lung may occur in children with pneumonia with the resulting development of bronchiectasis. Perry and King discuss the importance of "collapse" of a lobe following pneumonia as an important etiologic factor and state that "in 167 patients (42% of their series), the age of onset was in the first decade, a period when pneumonia, measles, whooping cough and other contagious fevers are common and these diseases may give rise to collapse." It is our feeling that collapse of a lobe is not the primary etiologic or pathogenetic factor in the development of bronchiectasis. On the contrary, it is believed that the development of a shrunken or "collapsed" lobe is a late manifestation of a disease process which has gradually led to the development of pulmonary fibrosis and bronchiectasis. The "collapsed" or shrunken lobe with bronchiectasis is the end result of a protracted chronic inflammatory process. In order to discover the primary etiologic or pathogenetic factors which eventually lead to this end result, one must often search far back in the medical history. In the great majority of cases, it is believed that the primary insult of the lung occurs during childhood.

Jackson, Clerf and many others have emphasized the importance of the inhalation of foreign bodies with the subsequent development of chronic pulmonary infection and bronchiectasis.

Until recently, most authors interested in bronchiectasis believed the condition was usually secondary to chronic paranasal sinus disease. In recent years, considerable evidence has accumulated to indicate that bronchiectasis is not necessarily associated with or secondary to chronic sinus disease. Goodale, Perry and King, and Riggins, have pointed out that while bronchiectasis and chronic sinus disease are not infrequently present simultaneously in the same patient, bronchiectasis is not always secondary to chronic sinus

disease, nor is sinus disease always present in patients with bronchiectasis. A study of many cases seen at Bellevue and Lenox Hill Hospitals during the past twelve years has emphasized these facts.

A review of one hundred cases seen at Lenox Hill Hospital during the past ten years shows that 30 per cent had definite chronic sinus disease. An analysis of the histories of these 30 cases showed that two-thirds had symptoms or findings, or both, of bronchiectasis from several months to several years *before* they developed chronic sinus disease. These and other observations have led to the definite impression that chronic sinus disease is perhaps more often secondary to bronchiectasis than it is a cause of or important etiologic factor in the development of bronchiectasis. In considering the etiologic relationship of the two conditions, it should be remembered that bronchiectasis usually has its onset in childhood and early adult life, and chronic sinus disease usually has its onset relatively later in life. Perry and King report that the onset of bronchiectasis occurred during the first decade in 42 per cent and during the second decade in 27 per cent of their patients. They gave no infor-

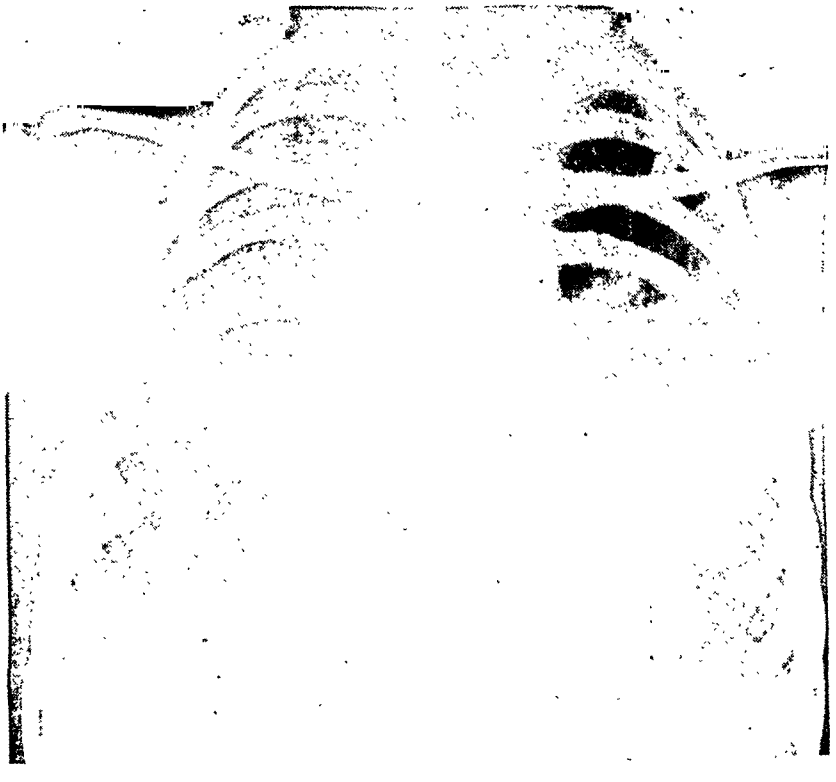

Fig. 1—B. P., aged two when first admitted to the hospital in 1932 with bilateral bronchopneumonia. The patient was acutely ill, cyanotic, dyspneic and required oxygen therapy for several days. Sputum typing was negative for pneumococci but cultures showed hemolytic streptococci predominating. Slow convalescence. During the following winter, the patient had two attacks of bronchopneumonia.

mation regarding the seniority relationship of the two conditions. In the cases studied at the Lenox Hill Hospital Clinic, the onset of bronchiectasis was apparently in the first decade in 41 per cent and during the second decade in 23 per cent of the cases.

In the classical case of bronchiectasis frequently developing after bronchopneumonia in childhood, often when streptococci are implicated, the early pathological changes which eventually lead to demonstrable ectasia of the bronchi are not confined to the lung parenchyma but almost always simultaneously involve the bronchial mucosa and submucosa (Figs. 1 and 2). As a result of repeated and protracted attacks of bronchopneumonia, chronic inflammatory changes in the bronchial mucosa and submucosa develop and progress. Signs of chronic bronchitis may persist and serial chest roentgenograms often show failure of the lungs to clear completely or as promptly as they should. Often, only with the arrival of the summer season does the patient improve clinically. Even then, roentgenologic study may show small patches of residual inflamma-

Fig. 2—B. P. Lipiodol bronchogram shows the presence of early predominantly saccular bronchiectasis especially in the right lung.

tory changes. During subsequent winter seasons, upper respiratory infections are likely to be followed by low-grade protracted bronchopneumonia with signs of "bronchitis." These chronic inflammatory changes may persist and progress to a state of extensive irreversible fibrosis of a segment or of an entire lobe.

After protracted periods of chronic infection, certain irreversible changes occur in the tissues of the bronchial wall. Areas of normal mucosa are destroyed and replaced with chronically infected granulation tissue. Elastic fibers and muscle bundles may become partly or largely replaced with fibrosis and, occasionally destruction of portions of the cartilaginous structures may result. As a consequence of these protracted destructive onslaughts, weakening of the bronchial wall is inevitable. Finally progressive shrinkage and contraction of a segment or of an entire lobe, ineffective and excessive coughing, and other factors, result in ectasia of the bronchi. Also as a result of these protracted chronic inflammatory changes in the bronchial wall, stenosis of the smaller bronchi may develop and as a partial consequence of the stenosis, the weakened, diseased bronchi become further dilated distal to the stenosis. Pooling of purulent secretions often containing anaerobic and aerobic micro-organisms occurs in the ectatic areas distal to the stenosis. These factors often combine to bring about saccular bronchiectasis which not infrequently is confused with cystic disease of the lung.

As a result of the protracted and irreversible pathological changes in the lung parenchyma and bronchi, the normal cleansing power of the bronchi and lung become impaired. A vicious cycle develops with increased vulnerability of the diseased lung and bronchi to further endogenous or exogenous infection. Visualization of the pathology and pathologic physiology makes it obvious why many patients are likely to suffer repeated relapses. It also explains why the disease is usually progressive, if not in the development of new bronchiectatic areas, certainly often in the development of increasing emphysema, fibrosis and suppurative pneumonia.

Many other factors may play a part in the pathogenesis of bronchiectasis. Bronchial polyps, benign tumors and stenosis of the bronchi resulting from tuberculosis or other causes, may interfere with the normal physiological function of the bronchi and permit aspiration and retention of infectious secretions with the subsequent development of protracted bronchopneumonia, lung abscess or eventually indurative pneumonia, shrunken lobe and bronchiectasis. Partial or complete occlusion of relatively easily compressible bronchi in children by caseous tuberculous mediastinal nodes not infrequently leads to protracted bronchopneumonia and bronchiectasis. This mechanism is probably more often implicated in

the development of bronchiectasis in children than is generally recognized.

The pathological changes in the lung parenchyma in advanced cases of bronchiectasis are multiple and may be predominantly proliferative or fibrotic, or emphysematous, and occasionally pulmonary cavities may develop.

Lung abscess is singularly infrequent in patients with bronchiectasis despite the repeated opportunities for inhalation of large quantities of purulent secretions containing anaerobic organisms. Should well defined lung abscess develop, it is usually located in previously "healthy" or nonbronchiectatic areas of the lung and results from inhalation of the infectious secretions originating in the ectatic bronchi.

The most important and extensive lung parenchyma change is proliferative or fibrotic in nature and is present in varying degrees in practically all cases of bronchiectasis. Occasionally, such changes may be minimal and hardly demonstrable roentgenologically. The degree of pulmonary fibrosis is often related to the amount and character of infectious secretions present. This relationship may, of course, be the reverse. Not infrequently, cases with extensive dry bronchiectasis have been observed in which fibrotic changes were conspicuously absent. Occasionally, in such cases, the bronchiectasis may not be definitely discernable on the roentgenogram without lipiodol bronchography. In other cases, there may be comparatively little fibrosis with extensive emphysema. Extensive emphysema may help to obscure roentgenological evidence of fibrosis. Occasionally, emphysema may so dominate the roentgenogram and clinical picture that the associated bronchiectasis may not be suspected. The emphysema may be largely limited to the bronchiectatic lobe or lung. However, with extension and progression of the areas of fibrosis, emphysema may develop throughout the lungs.

With the development of extensive fibrosis and emphysema, secondary related changes of the thoracic cage gradually develop, further limiting respiratory function and increasing the miserable existence of these already chronically anoxemic sufferers. The intercostal spaces may become widened, the cage more or less fixed in the inspiratory position, the diaphragm flattened and depressed into the abdominal cavity and its bellows action markedly diminished. Fluoroscopy reveals almost complete fixation of the diaphragm as well as the bony cage. As a result of these related chest wall and diaphragmatic changes, the pulmonary and cardiocirculatory reserve become greatly diminished and in some cases may become so depleted that slight to moderate respiratory infection may lead to severe dyspnea or orthopnea, cyanosis, persistent fatigue, mental lethargy, anoxemia, loss of weight, occasionally sig-

nificant psychological disturbances characterized by depression, melancholia and rarely dementia. Blood studies may show pseudopolycythemia or secondary hypochromic anemia. The patient may be hopelessly incapacitated both mentally and physically, though he may not actually feel ill.

The protracted toxemia and anoxemia may lead to significant damage of many vital organs. Amyloid degeneration of the kidneys, liver, spleen and occasionally the intestine is not infrequent. Brain abscess, myocardial degeneration and fibrosis, cor pulmonale, and eventually heart failure may develop.

In view of the great variety, degree and severity, of the pathology and pathological physiology of both the lungs and bronchi, and not infrequently anaerobic infection resulting in a foul odor to the sputum, it is not difficult to visualize the protracted morbidity and discouraging mortality of untreated or unsuccessfully treated cases of bronchiectasis.

MORBIDITY

The morbidity of any chronic illness, a condition most difficult to appraise, has probably not been given the consideration it rightfully deserves in patients with bronchiectasis. Protracted physical and mental invalidism often lasting from early childhood throughout a prolonged miserable life with the ultimate prospect of death, often resulting from pneumonia, lung abscess, pulmonary hemorrhage, or heart failure, is the picture which should be visualized, in considering the morbidity and treatment of bronchiectasis. Unfortunately, the surgeon and internist do not always keep in mind a kaleidoscopic view of the probable course of events. The "present status" of the patient may often unduly influence a critical appraisal of the hazardous future potentialities. Experienced general surgeons declined to do a lobectomy on a young nurse in good general condition, with right lower and middle lobe saccular bronchiectasis, who had had a long period of chronic invalidism including social maladjustment, and serious economic reverses as a result of patients not desiring her services because of her persistent cough—because at the time the patient was seen by the surgeons, the constitutional symptoms were mild.

A determination of the morbidity of any group of chronically ill patients is difficult and hazardous and founded largely upon impressions rather than upon scientific facts. Despite these handicaps, an appraisal of the morbidity of 100 cases of bronchiectasis observed at the Lenox Hill Hospital Clinic during the past ten years has been attempted by studying the hospital admissions, the frequency and severity of respiratory infections, the occurrence of hemoptyses, and other serious symptoms and conditions such as

chronic sinus disease, inability of the patient to work, the psychological condition and social adaptability and finally the course of the disease. While a statistical analysis of these data is impossible, nevertheless, a fairly definite impression, based on long personal observation and analysis, give one a fairly complete picture of the morbidity of bronchiectasis.

Readmissions of many of these patients to the hospital for reasons related to their bronchiectasis was frequent and varied from one to seven times during the maximum observation period of ten years. It was found that the readmission of bronchiectatic patients to the hospital was more frequent than of tuberculosis patients being treated in the same clinic. Respiratory infections, notably bronchopneumonia, occurred much more frequently in the bronchiectatic patients than in the tuberculosis patients. Many bronchiectatic patients had from three to five known attacks of bronchopneumonia during the maximum ten year period, and many undoubtedly had less severe unknown attacks. Hemoptysis was also a frequent and disturbing symptom and was often followed by febrile attacks, increase in cough and expectoration and the development of low grade bronchopneumonia. The exacerbation of chronic sinusitis, "bronchitis," pleurisy, and the occurrence of asthmatic and asthmatoid attacks often seriously interfere with the life of these patients.

The working ability or desire to work is difficult to evaluate with any degree of accuracy, especially when relief measures often provide greater economic security for many of these clinic patients than does the work which is available to them, and which is frequently interrupted during the spring and winter seasons by bronchopneumonia, hemoptyses or exacerbation of their disease, etc. In the traced patients, 25 per cent have been able to do full time work as a general rule and 40 per cent have been able to do part time work. The remaining 35 per cent were either unable to work at all because of the severity of their symptoms, or had forsaken the idea of economic rehabilitation because of the psychological effect of the disease. The many physical and psychological factors which constitute the morbidity of the disease, undoubtedly are largely responsible for the frequent failures among these people. Little wonder they become frustrated, depressed and are not overenergetic or ambitious. Churchill has forcefully emphasized the psychological aspect of the morbidity of bronchiectasis. A study of our patients in this regard reveals that the psychological morbidity is seldom fully evaluated by the physician, but is frequently left to the social worker. Serious psychological effects of the disease significantly influence the social maladjustment in many of these patients, more especially those having chronic cough and foul

expectoration. The fact that 70 per cent of our adult patients are single and 6.6 per cent of those married are divorced or separated, and only 25 per cent are doing full time work, many of these their own housework, emphasizes the great importance of the psychological as well as the physical disability. A combination of these factors was largely responsible for three of our patients attempting to commit suicide and was an important factor in the development of paranoia by one patient.

Chronic invalidism, usually beginning in childhood, often continuing throughout life, characterized by mental lethargy and inaptitude, physical unfitness and debility and social maladjustment, is the inevitable picture of many untreated and unsuccessfully treated cases of bronchiectasis. Indeed, the morbidity in many cases with extensive wet bronchiectasis consisting of protracted invalidism, economic insecurity, a life alone, apart, helpless and hopeless, not infrequently the development of a psychopathic personality, is often a more pathetic and greater problem for the physician than is the actual mortality of the disease. Little wonder that Churchill states that young adult patients rarely hesitate to elect a chance of cure if the possibility is offered. We regret with Churchill that "Unfortunately, we still see the patient who returns to his family doctor for advice and is told that the operation (lobectomy) is an impossible one and that to consent to it means certain death." It is also to be regretted that many of these patients are treated over long periods of time with bronchoscopic aspiration and lavage, roentgen therapy, or arsphenamine and bismuth. An analysis of the present status of our medically treated patients shows that only 13 per cent have improved; 47 per cent are symptomatically unchanged and 40 per cent are worse than when first seen.

MORTALITY

Many patients with fairly extensive bronchiectasis, especially comparatively dry bronchiectasis of the upper half of the lungs, may live a normal life span without severe or protracted invalidism. However, from the reports in the literature and our observations at Bellevue and Lenox Hill Hospitals, one may conclude that the majority of patients with wet bronchiectasis succumb to some form of respiratory illness or related complication either before or during the fourth or fifth decades. Reported mortality rates vary considerably depending upon the duration of observation, age at onset, type, extent, severity and location of the disease. The prognosis in cases of relatively dry bronchiectasis involving the right upper lobe and the upper portion of the left upper lobe is relatively good in comparison with the prognosis of bronchiectasis involving the

lower lobes, the right middle, and the lingula of the left upper lobe.

Roles and Todd report a mortality rate of 47 per cent in a group of 49 nonsurgically treated cases observed for six years. This rate is considerably higher than that usually found in cases observed for such a short period of time. In a series of 200 cases, Head found that of those having the onset during the first decade, few were living after the age of 40. Our observations have been somewhat similar to those of Head. However, we have a considerable number of patients living in their *sixth* or *seventh* decade in whom the onset of bronchiectasis was during childhood. Perry and King found a mortality rate of 26 per cent in nonsurgically treated cases, 41 per cent of these dying within five years of the onset, and 15 per cent living for as long as 20 years after the onset. Seventy-eight per cent of their mortality was directly the result of respiratory diseases. They also found that the working and living capacity was excellent in 67 per cent of the surgical group and in 38 per cent of the nonsurgical group.

The estimated duration of the bronchiectasis in the series of 100 cases studied at Lenox Hill Hospital is 16.4 years. The average age of these patients is 35.8 years. Fifteen of the patients have not been traced during the past year. Their status is unknown. The known mortality of the 85 traced medically treated and untreated patients observed during a ten year period is 14.1 per cent.

TREATMENT: PROPHYLAXIS

In view of the varied etiology and pathogenesis of bronchiectasis and associated pulmonary fibrosis and emphysema, any attempt at prophylaxis should be on a general basis designed to prevent or reduce severe and protracted respiratory infections, especially those likely to occur in childhood. Since the primary pulmonary damage which eventually may progress to bronchiectasis usually occurs in childhood, the prevention of bronchiectasis devolves largely about the management of the infectious diseases of childhood, especially the exanthemas, pneumonias and more especially streptococcic and influenza bronchopneumonias, and is primarily the problem of the pediatrician and general practitioner.

Children unduly susceptible to respiratory diseases should be treated extremely promptly and the convalescent period should be more prolonged than usual. This should include a longer period of bed rest than is customarily given and every effort should be made to build up the general resistance to infectious diseases. In addition, when feasible, removal of the child to a warm, dry climate during the winter and spring seasons may be of definite value, whereas climatic treatment in the extensive case of bronchiectasis can only result in palliative improvement at best, and should never be sub-

stituted for accepted surgical treatment when this form of treatment is indicated and feasible. In cases with bronchopneumonia, prompt and, if necessary, prolonged administration of one of the sulfa drugs should be given. The progress of the resolution of the pneumonia should be followed carefully. Chest roentgenograms are essential to determine if and when the disease has completely cleared. It is of the utmost importance that complete clearing be evidenced not only by physical findings and the clinical picture, but by chest roentgenograms. Any protracted case of bronchopneumonia in children takes on added significance and should be treated accordingly if it is realized that such prolonged infection is often the forerunner of bronchiectasis, pulmonary fibrosis and disabling emphysema, none of which may become clinically manifest or diagnosed until adulthood. Good prophylactic therapy depends not only upon treatment of actualities but upon the visualization of future potentialities.

The prompt removal of foreign bodies, polyps, and benign tumors from the bronchus is of the greatest importance if serious pulmonary infection and the subsequent development of irreversible fibrosis, emphysema and bronchiectasis is to be prevented. Also, prompt and adequate treatment of lung abscess, including surgical drainage if necessary, often prevents residual fibrosis and bronchiectasis. While it is admitted that the prevention of bronchiectasis is difficult at best, nevertheless, its prevention is probably less difficult than its cure. It should be emphasized that proper and prolonged treatment of repeated or protracted cases of bronchopneumonia in children may prevent the development of serious irreversible lung damage and bronchiectasis in later life. Realization of this definite possibility should give one sufficient courage to insist upon prolonged and proper treatment of the bronchopneumonias, more especially the atypical or recurring protracted bronchopneumonias of childhood.

Insofar as our present knowledge goes, there is no medical cure of well developed bronchiectasis and its associated fibrosis and emphysema. We have tried the usual methods of medical therapy, however, without any lasting beneficial results except for symptomatic improvement. Postural drainage in cases of well advanced wet bronchiectasis three or four times daily, beginning in the early morning before breakfast, and repeating the procedure about an hour before each meal, and again before retiring, the usual efforts to improve the general condition and increase resistance to infection, occasionally pneumothorax in cases of relatively dry hemoptic bronchiectasis to control hemorrhage, generalized heliotherapy especially during the winter and spring, and occasionally autogenous vaccines combined with cold vaccine with the hope of pre-

venting or minimizing acute upper respiratory infections may have some beneficial effect in certain cases of bronchiectasis. However, it should be explained to the patient or the family that such measures do not result in cure of the disease. We have not used arsenicals, and find it difficult to visualize any possible benefit from their use, but have seen patients who have received arsenicals elsewhere without any beneficial effect. A patient was seen recently who was thought by some to have bronchiectasis and was given arsphenamine and, because of severe reactions and jaundice, bismuth was later substituted. After the patient's return from the South she was referred to us and was found to have chronic bronchitis, and lipiodol bronchography revealed no bronchiectasis.

ROENTGEN RAY THERAPY

In recent years, a considerable number of roentgenologists have treated bronchiectasis with roentgen ray therapy. Berck advocated this form of treatment in 1934. In his report of a case he stated that "The purpose of this communication is to state the rationale and report the results of radiotherapy in a case of bronchorrhea in bronchiectasis." He further postulated that "The purpose of the application of radiotherapy, briefly, is to render the hypertrophic, hypersecreting bronchial mucosa atrophic and thus convert a 'wet' bronchiectasis into a 'dry' bronchiectasis."

Berck's assumption that "the hypertrophic hypersecreting bronchial mucosa" is the source of purulent secretions in bronchiectasis seems contrary to the general concept of the origin of the purulent secretions in bronchiectasis. We believe that these secretions are the product of suppurative pneumonia and ulcerative bronchitis and bronchiectasis rather than the result of a "hypersecreting hypertrophic bronchial mucosa." Indeed, the bronchial mucosa often no longer exists as such in patients with extensive bronchiectasis but is largely replaced by chronically inflamed granulation tissue. Such theoretical reasons seem not to be founded on a correct visualization of the pathology and pathological physiology of bronchiectasis. In 1939, Berck and Harris had apparently abandoned their first theory explaining their rationale of roentgen therapy for bronchiectasis and at that time offered the following hypothesis: "Further explanatory hypotheses may be adduced to explain the successful action of roentgen rays in suppurative bronchiectasis, such as possible enhancement of immunity processes both through the action of the rays and to body action and the physicochemical alterations of the local tissue reactions." They concluded in their last report that roentgenotherapy for bronchiectasis is "both feasible and successful."

As a result of Berck's encouraging report in 1934, several of our

patients with wet bronchiectasis were given roentgen therapy. Many of them experienced mild to moderate exacerbation of the local symptoms and some developed febrile attacks while receiving treatment. Occasional patients, however, developed what appeared to be related temporary remission of symptoms following mild exacerbations. A follow-up of these patients revealed that the course of the disease had been quite similar to that before roentgen treatment was given. We have not found any lasting beneficial effect in any case. On the contrary, we have seen roentgen treatment result in the development of irreversible damage to the lung in the form of a fairly acute pneumonitis or pneumonia with persisting chronic fibrotic changes. The following case illustrates the potential and actual hazards and danger of roentgen therapy in the treatment of bronchiectasis:

G. L., male, aged thirty-four, was admitted to the Lenox Hill Chest Clinic in 1934 with saccular bronchiectasis of the lower half of the left lower lobe, and cylindrical ectasia in the lingula of the left upper lobe. Therapeutic bronchoscopy had been done over a period of many years before coming to our clinic, apparently without any improvement in his condition. Lobectomy was advised but refused. Roentgenotherapy was suggested and accepted. Before roentgenotherapy was begun, there was a moderate amount of fibrosis limited to the lower third of the left lung field. The upper half of the lung was normal on physical and roentgenological examinations.

In the latter part of 1934, and in the summer of 1935, the patient was given two series of roentgen ray treatments by the radiology department. Approximately 1,500 r. were given through each of several portals, with a total of 6,000 r. Some of the treatments were inadvertently directed to the upper half or normal part of the left lung. A few days after receiving treatment over the upper half of the lung, the patient developed pain in the left upper chest, with a temperature rise to 101.6° F. and increased cough and expectoration. After admission to the hospital, the chest roentgenogram revealed a new area of clouding in the left upper half and also increased clouding in the left lower third. At first these changes were thought to be the result of bronchopneumonia. However, the persistence of the inflammatory changes in the left upper third, where there was no bronchiectasis, and their final conversion into fibrosis which persisted until the patient's death, convinced the staff that the condition was one of x-ray pneumonia.

The unfortunate circumstance that resulted in the patient receiving roentgenotherapy over the left upper, or normal lung field, offered an opportunity to evaluate more accurately the effect of such treatment on the part of this patient's normal as well as the diseased part of the lung. Prior to this experience, evidence of increased pneumonia and fibrosis following roentgenography to the bronchiectatic area was thought to be due to the natural extension of the disease. However, the above and other similar obser-

vations, and the work of Desjardins, Jacobsen and others, convinced us that roentgenotherapy, if the dose is sufficiently large and purposefully directed through several portals to converge on a selected area of the lung, may cause serious acute inflammation of the lung with irreversible damage in the form of fibrosis. If the damage to the lung is sufficiently great, roentgen therapy may

Fig. 3—H. V. White male, aged forty-two, had repeated hemoptyses, cough, large amounts of occasionally foul-smelling sputum, chest pain, bouts of fever and fatigue. Chest roentgenogram in 1922 by another physician revealed a large area of dense clouding in the mid-third of the right lung field adjacent to the hilum. Symptoms at that time were chest pain and dry cough. Tumor of the mediastinum or right lung was diagnosed (1922). The patient was given large doses of roentgen ray therapy during the next few years. Chest roentgenogram in 1937 showed a markedly shrunken and fibrotic right lung. Lipiodol bronchogram revealed cylindrical bronchiectasis, right. January, 1938, the patient died of bronchopneumonia. Autopsy by Dr. Victor Jacobsen revealed extensive chronic interstitial pneumonia and bronchiectasis of the right lung, adhesive pleuritis and bilateral bronchopneumonia. The case is cited to show the deleterious effects on the lung tissue and bronchi of large doses of roentgen ray therapy. Fig. 3 is a sagittal section through the right lung showing extensive fibrosis, thickened pleura and bronchiectasis.

actually result in the development not only of fibrosis of the lung but also bronchiectasis. This has been observed in a case reported by the writer. Jacobsen also reported upon the deleterious effects of deep roentgen therapy directed to the lungs. The following case illustrates the severe deleterious effects of large doses of roentgen therapy to the lung (Fig. 3).

H. V., a white male, aged forty-two, was referred by Dr. Victor Jacobsen of Troy, New York, in 1937, because of repeated hemoptyses, cough, large amounts of occasionally foul smelling sputum, chest pain, occasional bouts of fever and marked fatigue. Chest roentgenogram in 1922 by another physician revealed a large area of dense clouding in the mid-third of the right lung field adjacent to the hilum. The only symptoms at the time were severe chest pain and dry cough. Tumor of the mediastinum or right lung was diagnosed at the time (1922). Diagnosis was confirmed by several physicians and the patient was given large doses of x-ray therapy during the next few years by different physicians. Chest x-ray in 1937 showed a markedly shrunken and fibrotic right lung, undoubtedly the result of large doses of roentgen ray treatment. Lipiodol bronchography revealed cylindrical bronchiectasis. About one year later, January, 1938, the patient died of bronchopneumonia. Autopsy by Dr. Jacobsen revealed, among other things, extensive chronic interstitial pneumonia of the right lung with adhesive pleuritis, bilateral bronchopneumonia and extensive bronchiectasis of the right lung. The case is cited to show the deleterious effects on the lung tissue and bronchi of large doses of roentgen therapy. Fig. 3 is a sagittal section through the right lung showing extensive fibrosis, thickened pleura and bronchiectasis.

As a result of our experience with roentgenotherapy for bronchiectasis, having observed irreversible fibrosis and emphysema develop in a number of treated patients, it is believed that roentgen ray therapy for bronchiectasis should not be given.

BRONCHOSCOPY

Diagnostic bronchoscopy is indicated in practically all cases of suspected or known bronchiectasis. However, it is difficult to visualize how repeated "therapeutic" bronchoscopy can be of benefit except in a very limited number of patients having foreign bodies with granulation tissue in the bronchi, benign bronchial tumors or partial occlusion of the bronchus.

Lavage of the bronchi with the various so-called "bactericidal" agents, including collene advocated by some bronchoscopists, is useless and dangerous. Injection of "bactericidal" solutions into the bronchi increases the amount and liquidity of infectious secretions and enhances a spill-over of these secretions into relatively uninvolved portions of the lung. We have seen severe febrile reaction with extension of the pneumonia following bronchoscopic

lavage with collene. Such treatment is definitely dangerous and should be strongly discouraged.

The failure of medical measures to result in a cure of bronchiectasis, the protracted physical and mental morbidity and high mortality, its tendency to localize in one or occasionally two or more lobes, undoubtedly encouraged thoracic surgeons and internists to seek a more satisfactory method of treatment of the disease. Many recent reports of the successful surgical treatment of bronchiectasis and associated suppurative pneumonia by Churchill, Overholt, Bohrer, Berry, O'Brien, Haight, Heuer and many others should convince the most skeptical regarding the success of this form of treatment.

The operative mortality in 122 modern type lobectomies performed on 116 patients by Dr. Edward Churchill was reported as being only 3.3 per cent. This low mortality rate is convincing evidence that lobectomy or occasionally pneumonectomy for selected cases of bronchiectasis by experienced thoracic surgeons is not only a safe procedure, but the only method of curing the bronchiectatic patient. Those who would be content with postural drainage, bronchoscopic lavage, roentgenotherapy, arsenicals and bismuth, and are misled into believing that natural temporary remission of symptoms is the result of these medical measures, cannot be aware of the natural behavior of the disease, and refuse to be convinced of the feasibility and curability of lobectomy in many cases of wet bronchiectasis.

CONCLUSIONS

1) Despite the abundance of reliable data on bronchiectasis, widely different opinions still exist, especially regarding treatment.

2) Bronchiectasis is usually an acquired condition although apparently still occasionally confused with congenital cystic disease. The onset of bronchiectasis is usually in childhood or early adult life.

3) Repeated or protracted bronchopneumonia in childhood, especially where streptococci are implicated, is frequently the cause of primary and irreversible damage to the lung and bronchi and is often the forerunner of clinical bronchiectasis with associated fibrosis and emphysema.

4) Chronic paranasal sinus disease usually has its onset relatively later in life than does bronchiectasis. Disease of the paranasal sinuses is perhaps more often *secondary* to bronchiectasis than is bronchiectasis secondary to sinus disease.

5) Medical and bronchoscopic treatment does not result in a cure of bronchiectasis. These measures may result in symptomatic and temporary improvement.

6) The morbidity and mortality of untreated and medically treated wet bronchiectasis, particularly of the lower lobes, is such that the physician who routinely advises young adults with operable bronchiectasis against surgery, assumes a grave responsibility and frequently renders the patient a great disservice.

7) Practically all patients with bronchiectasis and chronic suppurative pneumonia are curable at some phase of the disease by lobectomy or pneumonectomy.

RESUMEN

CONCEPTOS ACTUALES DE ETIOLOGIA, PATOGENIA, MORBILIDAD, MORTALIDAD Y TRATAMIENTO DE LAS BRONCHIECTASIAS

1) A pesar de la abundancia de datos valiosos en bronquiectasias todavía existe amplia disparidad de opiniones especialmente respecto al tratamiento.

2) La bronquiectasia es comunmente una afección adquirida aunque aparentemente todavía confundida en ocasiones con una enfermedad quística congénita. El comienzo de la bronquiectasia es usualmente en la niñez o en la temprana edad adulta.

3) Repetidas o prolongadas bronconeumonias en la niñez particularmente las de origen estreptocóccico constituyen frecuentemente la causa de un daño primario e irreversible del pulmón y los bronquios, y es amenudo el origen de la bronquiectasia clínica asociada con fibrosis y enfisema.

4) La enfermedad crónica de los senos paranasales comienza comunmente en períodos de la vida mas tardíos que la bronquiectasia. La enfermedad de los senos paranasales es tal vez mas frecuentemente secundaria a la bronquiectasia, que ésta última secundaria a aquella.

5) El tratamiento médico y broncoscópico no da como resultado una cura de la enfermedad. Estas medidas pueden proporcionar una mejoria solo sintomática y temporaria.

6) La morbilidad y mortalidad de las bronquiectasias húmedas de los lóbulos inferiores en sujetos no tratados y tratados medicamente es tal, que el médico que intencionadamente desaconseja el tratamiento quirúrgico a pacientes jóvenes, portadores de bronquiectasias operables, asume una grave responsabilidad y frecuentemente ocasiona al paciente un gran perjuicio.

7) Prácticamente, todos los pacientes con bronquiectasias y neumonias supurativas crónicas son curables en alguna faz de la enfermedad por medio de la lobectomía o neumectomía.

840 Park Avenue.

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Roentgenologic Aspects of Bronchiectasis*

WILLIAM E. ANSPACH, M.D.
Chicago, Illinois

It is now generally agreed that clinical signs and the findings at physical examinations alone are insufficient for the positive recognition of bronchiectasis. Regular chest roentgenograms and bronchographic examinations are essential for this purpose and to ascertain the extent of the damage in the pulmonary tissue. To say that the picture may be almost normal, or in a great many cases, *show peribronchial streakiness,* or that in certain cases pronounced *scarring and cavitation* seem to be present, is not an adequate description of the roentgenographic side of bronchiectasis. Also, the presence of a triangular basal shadow (Fig. 1) or a wedge-shaped apical shadow is not a pathognomonic sign of bronchiectasis and needs further evaluation. While all of these features have been recorded on regular chest roentgenograms, a bronchographic film is required to demonstrate that actually dilated bronchi exist. These signs can best be described in relationship to the pathogenesis of

*From the Children's Memorial Hospital, Chicago, Illinois

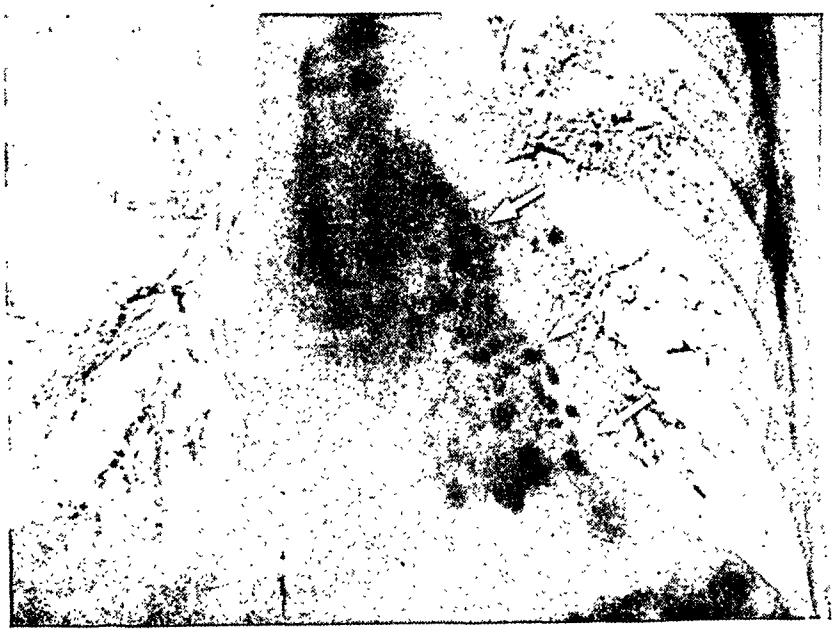

Fig. 1—Boy, age 10 years. Dense triangular shadow seen through the heart shadow. Atelectasis of the left lower lobe has been present for a long period. Note large globules of opaque oil which reveal bronchial dilatations. These triangular shadows indicate atelectasis—only after destructive changes occur in the lung is bronchiectasis found.

bronchiectasis as seen roentgenographically in a large group of patients, most of whom have been observed in a fairly early stage of the disease, and many followed through to large dilatations. While x-ray makes a complete diagnosis in far-advanced cases (Figs. 2 and 3), it is obvious that the clinical and physical findings along with the history must be correlated with x-ray signs in an early stage of the disease process—before abnormal dilatations are present.

Basal triangular shadows which have a definite relationship to bronchiectasis,[1,2,3,4,5] have been a most common finding in small children. Their frequency has decreased directly in proportion to the age of the patient from the second year on. These triangular shadows represent shrunken atelectatic lobes. The bronchi are filled with thick, tenacious secretions and while there is a constant overflow into the larger air passages, air enters in unusually small quantities or not at all for a varying period of time. The heart is

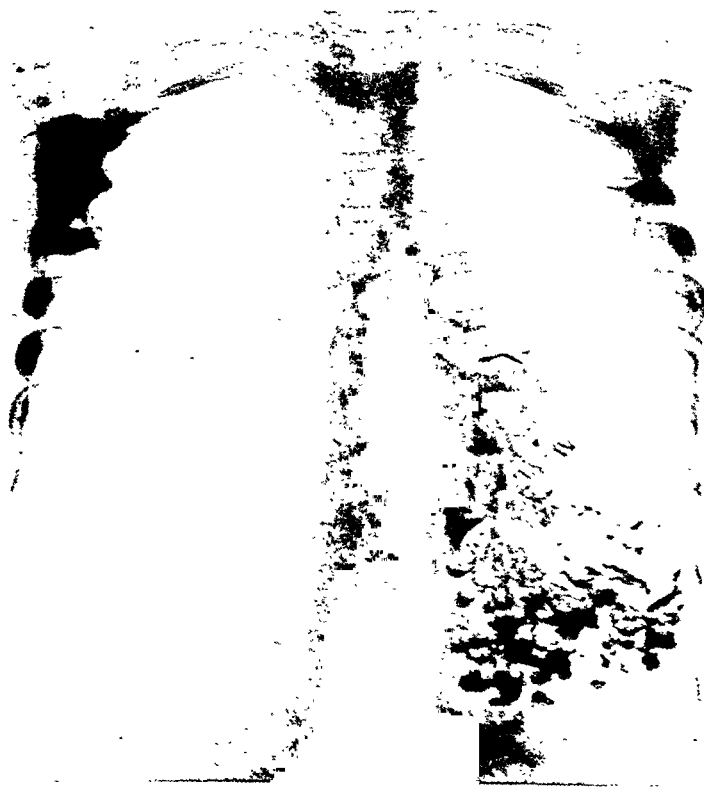

Fig. 2 (Case 40094)—Iodochloral in bronchi of the left lower lobe showing saccules in the smaller bronchi. The bronchi of the 2nd and 3rd divisions are diffusely enlarged. This is an example of the changes usually seen following a prolonged atelectasis which is revealed on the plain chest film as a basalar triangular shadow. Here gas in stomach aids in outlining the saccules near the diaphragm.

displaced toward the affected side and frequently the intercostal spacing is narrowed and the leaf of the diaphragm is elevated. The heart and mediastinal structures are displaced toward the affected side in both inspiration and expiration views. These shadows of atelectasis constitute a threat of bronchiectasis. The absence of pronounced pulmonary signs after the onset, which is usually characterized by a chill and rise in temperature has caused many errors in interpretation and evaluation of these shadows. During an early stage it is most often diagnosed as pneumonic consolidation. Too often the patient is allowed to be discharged from the hospital without an additional x-ray examination but when this is made, the triangular shadow noted earlier is still present, although the patient's temperature may be normal or only slightly above or below normal. If films are taken at still later intervals, it is seen that the triangular shadow in the majority of instances continues to be present in infants and young children. The patient returns to the doctor or hospital because of "not doing well." When oil, opaque to the x-ray, is injected into the bronchi, even though the oil mixes with the retained secretions in the collapsed portion of the lung, bronchial dilatation may not be demonstrable for several weeks or months. However, as a rule, a homogeneous well-collapsed lower lobe that remains markedly shrunken, reveals some evidence of bronchial dilatation within six weeks or two months in infants.

If spontaneous drainage of the affected lung tissue occurs, or if the secretions are withdrawn due to an inverted 40 degree angle

Fig. 3—Saccular bronchiectasis in a partially collapsed lower lobe and similar bronchial dilatation of the middle lobe superimposed upon the highly emphysematous enlarged upper lobe.

posture and coughing exercises, or if the secretions are withdrawn by direct bronchoscopic aspiration, air may again enter the affected lung. Depending upon the amount of damage to the bronchi and adjacent tissue, re-expansion may occur. Here it must be stated that when bronchoscopic aspirations are repeatedly carried out at this stage of the disease, bronchiectasis develops infrequently. Even though the triangular shadow does not entirely disappear following repeated aspiration, sufficient drainage often occurs to allow eventual re-expansion of the lung without demonstrable bronchiectasis in a very high percentage of cases. Expansion is seldom immediate but often some re-expansion is noticeable within a few days. Triangular shadows which represent an entire lower lobe are readily recognizable on films but the same changes occur in lobules that occur in lobes and may occur in clusters of alveoli. The latter may be neutralized on the film by neighboring emphysema or are seen as "soft" shadows well out in the parenchyma. As a rule the entire lobe is atelectatic in young children. Change in size and density of the atelectatic tissue from one examination to the next has come to be regarded as a favorable sign as it is this group which frequently return to health. A lesser degree of damage in the lung tissue is present. In the obstinate or neglected case, atelectasis may disappear but this occurs only after bronchiectasis has developed. As the bronchi dilate, there is often better drainage

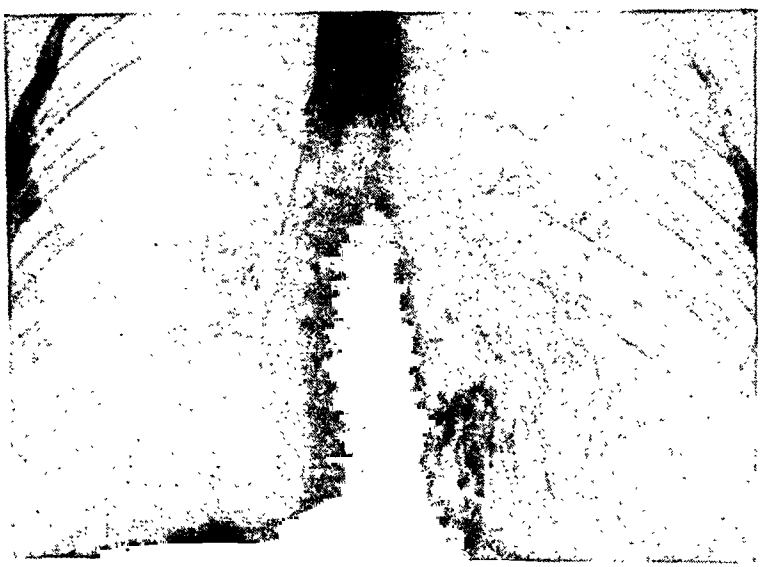

Fig. 4—Tubular bronchiectasis. This developed following a triangular shadow which fluctuated in size and density from one examination to the next. Postural drainage was used for 5 years before dilatations could be demonstrated. This is an example of the triangular basal shadow which did not show constant collapse.

and there may be little evidence of retained secretions in the bronchi or alveoli. The disease is recognizable at this stage by peribronchial shadows, marked bronchial scarring, and frequently areas of collapse at intervals. The "dry" appearance is seldom seen except in an advanced stage. Tubular bronchiectasis (Fig. 4) seems to be a favorite of the infant with a markedly shrunken lobe. Older children more often have fluctuating shadows. In infancy the lower lobe is frequently hidden by the heart shadow unless films are exposed more than on routine chest roentgenograms. In the presence of highgrade collapse, bronchiectasis develops rapidly and tubular bronchiectasis can frequently be demonstrated at the end of six weeks. In large areas of atelectasis, saccular bronchiectasis is more prone to be discovered. Irregular or circular areas of decreased density within the otherwise homogeneous shadow, due to air in the bronchi, offer a clue to the presence of large dilatations. In other cases the dilated bronchi are completely filled with fluid and can be demonstrated only when this fluid is replaced by an opaque oil (Fig. 1). A network of fibrotic scarring is seen when less fluid is retained, this usually means that a moderately ad-

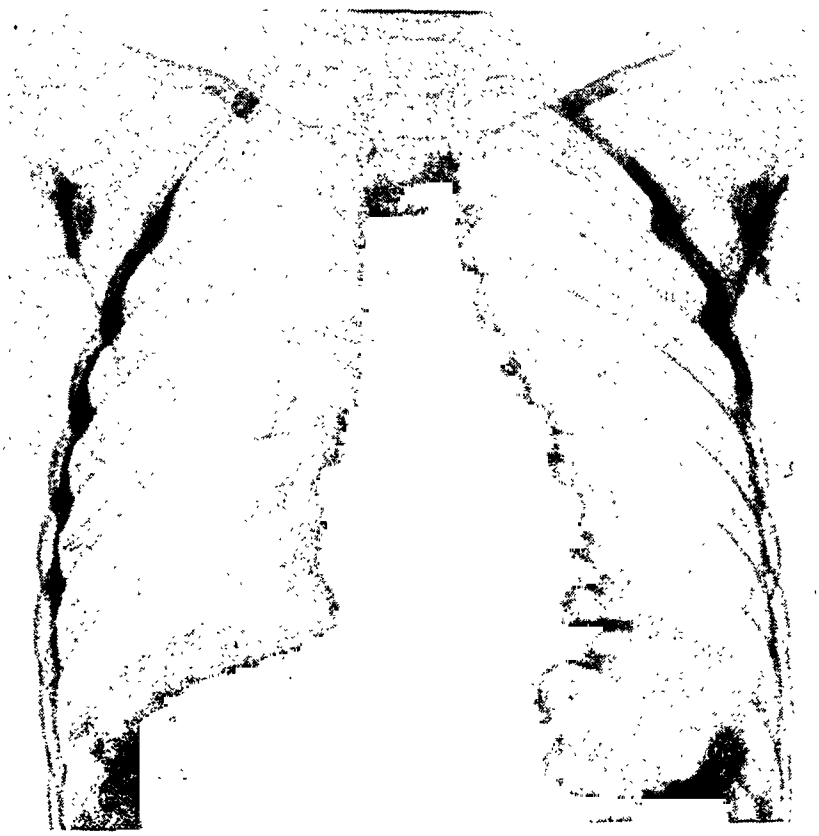

Fig. 5 (Case 34027)—B. C., October 28, 1938. Female, age 7 years. Normal roentgenogram of chest.

vanced stage has been reached. If the tissue damage is not too great only the bronchial scarring may be carried over into adult life. Adults less seldom develop bronchiectasis because of larger lumena of the bronchi and hence better evacuation than in childhood. In rare instances only accentuation of the bronchi show on roentgenograms taken at one stated period. Later a number of these will show either the triangular shadow or a smaller zone of condensation (atelectasis). Since roentgenograms may be made at any one period during the process of development, a statistical analysis of the various x-ray patterns would be meaningless.

By far the most common cause of bronchiectasis is bronchial obstruction due to thick, sticky secretions which follow infection or foreign material. The small size of the bronchi, long recumbent posture, and weak evacuation mechanism in infants predispose to prolonged bronchial obstruction. Farrell[5] stated that 80 per cent of his patients dated their symptoms from the first decade in life.

Fig. 6 (Case 34027)—May 27, 1939. Note dense shadow of right upper lobe with elevation of transverse fissure, greater inflation of normal lung tissue elsewhere and some flattening of the leaves of the diaphragm and mediastinal displacement to the involved side.

Fig. 7A

Fig. 7B

(Case 34027)—Three weeks later, A. P. and lateral views after an unsuccessful attempt to get oil in the collapsed upper right lobe. Oil is seen in the alveoli of the right lower lobe and in bronchi of the right middle and right lower lobes. There is no x-ray evidence of bronchiectasis. These films were made following the removal of a bronchial cast from the right upper lobe when partial temporary clearing occurred.

Ogilvie[7] in a recent article, contributed 45 of 68 cases or 66 per cent to symptoms dated from the first 5 years of life and in 37 of 45 to the first two years of life. It is evident that this disease starts in childhood. If a hopeless bronchiectasis is to be averted, treatment must be instituted before the dilatation of the bronchi takes place. In order to recognize the disease in its early stages the x-ray signs of atelectasis become of ever-increasing importance. It is the highly significant pre-bronchiectatic state.

In a symposium of this kind, space does not permit a demonstration of a large group revealing all of the various roentgen manifestations of the disease, but one case which has been of special interest is illustrated here because it demonstrates the fairly rapid development of tubular and saccular dilatations as well as numerous large thin-walled cyst-like cavities in the parenchyma of the lung. At the first examination the roentgenogram appeared normal (Fig. 5). Later, atelectasis of the right upper lobe developed and a large cast was removed bronchoscopically from the main bronchus of the upper lobe. The shadow almost disappeared and then reappeared

Fig. 8 (Case 34027)—August 8, 1940. There is now dense clouding of the previously normal right middle and lower lobes.

(Fig. 6). Iodochlorol injected into the lung showed the oil in normal bronchi and alveoli of the right middle and right lower lobes (Figs. 7a and 7b), but the involved lobe did not take the oil. The middle and lower lobes became atelectatic (Figs. 8 and 9) and weeks later showed both tubular and saccular bronchiectasis developing at the same time (Figs. 10a and 10b), followed still later by the appearance of numerous circular air shadows near the periphery of the longer involved upper lobe (Figs. 11a and 11b). These large thin-walled air pockets advanced rapidly to enormous size. A pulmonectomy was considered but the date of operation was repeatedly delayed because of the illness of the patient. Eventually, the right lung was successfully removed (Fig. 12). All of the dilatations proved to be bronchiectatic in character. The larger dilatations were near the terminal bronchi and included alveoli. While the changes noted in this case are more spectacular than in most cases in which

Fig. 9 (Case 34027)—August 31, 1940. Oval and circular air pockets are clearly visible in the upper and anterior thirds of the lung. Less density elsewhere. Signs of pulmonectasia.

only the basal triangular shadow was present, it supports previous conceptions that tubular, saccular and large bronchiectatic thin-walled cavities have a similar mode of development.

The development of enormous dilatations in the space of a few weeks in one case, while others go for years and develop only slight tubular or fusiform dilatations must be explained upon the weakness of the bronchial wall, the type of infection and the degree of atelectasis produced and maintained. The findings in the specimen of this case could best be described as pulmonectasis.[7] The bronchioles as well as the alveoli shared predominantly in the large cyst-like dilatations.

The major mechanical and pathological changes in the lung which brought about bronchiectasis seem to vary only slightly regardless of the kind of infection, the degree of distribution or the roentgen appearance. This would seem to include the group recently called "bronchopneumonic" by Ogilvie[7] in contrast to the atelectatic group. The bronchopneumonic roentgen picture is frequently seen in purulent tracheobronchitis, which occasionally leads to an early bronchiectasis. An infection caused by the staphlococcus aureus, which is commonly bronchogenic in fibrocystic disease of the pancreas, occasionally blood born from boils and carbuncles, and frequently found in the prolonged sojourn of certain foreign bodies, tends to produce this bronchopneumonic pattern on chest roentgenograms. It is associated with minute abscesses which cause destruction of lung tissue, which is later replaced to a considerable extent by fibrous tissue. In fibrocystic disease of the pancreas these changes have followed the course of the bronchi causing most often linear shadows which radiate from the hila, but in all of our cases in which bronchiectasis was present at necropsy, atelectasis had been a predominant finding on the roentgenogram covering a period of at least a few weeks. In the majority of these cases atelectasis was fleeting in character and when death occurred there was no evidence of bronchiectasis. Bronchiectasis associated with tuberculosis is rarely demonstrated by the instillation of oil opaque to x-ray, but atelectasis commonly occurs in tissue adjacent to the tuberculous lesion. It is usually distal to the tuberculous node and frequently extends to the periphery of the lung. Leptothrix making up a solid bronchial cast and plugging the bronchus almost completely was removed from the right upper lobe in one instance (see figures 5 to 12). It was in this portion of the lung that tremendous bronchiolectasis occurred within a short period of time. Well developed bronchiectasis, as seen clinically, has regularly been foreshadowed by chronic atelectasis, large or small, and later there has been extensive fibrous tissue formation, irrespective of roentgen appearance early or during the time dilatations are developing.

Fig. 10B

Fig. 10A

(Case 34027)—April 12, 1941. A. P. and lateral views after instillation of opaque oil reveal enormous saccular bronchiectasis in the posterior and lateral two-thirds of the lower lobe and tubular bronchiectasis of the mesial and anterior one-third. Large ballooned out air pockets near the periphery.

Fig. 11A

Fig. 11B

(Case 34027)—October 29, 1941. A. P. and lateral views show network of large thin-walled cavities at site of previously noted smaller air pockets. The lower lobe (lateral view), does not show large thin ballooned cavities as elsewhere.

Large bronchiectatic cavities which develop in dependent bronchi and bronchiolectatic thin-walled cavities which more frequently form in upper portions of the lungs seldom produce contra-lateral displacement of the mediastinal structures. Atelectasis and fibrosis in adjacent lung tissue tends to compensate for the increased volume of the large saccules.

The importance of discovering an atelectatic bronchiectatic process in children lies not alone in that a lobectomy can be done with less risk but that the disease can be recognized early, before irreparable damage, when steps can be made to drain the bronchi and bronchiectasis be avoided.

The fibrosis which has accounted for the hair-line strands of density in the bronchiectatic portion of the lung, is now attributed to the preceding atelectasis. Hennell[8] states that, "the marked pul-

Fig. 12 (Same case)—Removed right lung sectioned lengthwise (after fixation). Well formed cyst-like cavities are seen in the upper lobe and large dilated bronchi are seen in the lower lobe. Tubular bronchial dilatations were found in the anterior and mesial portions of this lobe.

monary fibrosis which develops after atelectasis occurs, eventually dominates the picture." "The most striking change is the extreme fibrous tissue formation; this occurs in a degree never observed under other conditions," according to Hamman and Sloan.[9] It is safe to assume that considerable fibrosis is present when an atelectatic shadow has remained on x-ray films covering a long period. Only by highgrade emphysema can the affected lobe ever regain its normal volume. It is a mixture of fibrosis and emphysema that accounts for the fine network of shadows seen years following the initial atelectasis.

Supporting the views of an ever-increasing number who have attributed a dominating rule to atelectasis in the development of acquired bronchiectasis, Andrus[10] says, "Atelectasis being the only completely satisfactory and undisputed agent to which bronchiectasis is currently attributed, it is legitimate to consider whether this may account for still further cases in the otherwise unexplained group." So-called congenital cystic disease may belong to a group developing soon after birth with atelectasis as a forerunner. Opportunity to observe cystic disease in the first month of life has not come our way. It may be noted that case (B. C. Figs. 5 to 11) illustrated here has the appearance on late films compatible with so-called congenital cystic disease.

In conclusion one must not only recognize the network of shadows and the streakiness that so often indicates the presence of bronchiectasis, but he must suspect bronchiectasis as a possible future development in all cases of persistent or intermittent collapse of any portion of the lung. The most common cause of bronchiectasis is a disease process which hinges on atelectasis. This is most often recognizable in an early stage by the triangular shadow of increased density at the base of one or both lungs. If this shadow can be dissipated, bronchiectasis can be prevented. Most bronchiectasis of the lower lobe can be traced to childhood and by far the majority to the first two years of life. There is no proof that many cases called "congenital cystic disease" have a different origin or that the changes have occurred in prenatal life. There is no reason to suspect that the bronchial dilatation associated with a tuberculous lesion is dependent upon any special characteristics of the tubercle bacillus or that its pathogenesis is different from other bronchiectasis. The change from the normal lung to various forms of bronchial dilatation can be readily observed on regular chest roentgenograms or bronchograms made at fairly frequent intervals. X-ray is necessary for the positive identification of bronchiectasis and for the early recognition of atelectasis which precedes bronchiectasis.

1150 N. State Street.

RESUMEN

ASPECTOS ROENTGENOLOGICOS DE LAS BRONQUIECTASIAS

En conclusión, no solamente tendremos que reconocer la red de sombras y la pequeña hemoptisis que tan amenudo indican la presencia de bronquiectasias si nó que también debemos sospechar las bronquiectasias como un futuro posible en todos los casos de colapso persistente o intermitente de cualquier porción del pulmón. La causa más común de bronquiectasia es el proceso mórbido dependiente de la atelectasia. Este es amenudo reconocible precozmente por la sombra triangular de aumentada densidad en la base de uno ó ambos pulmones. Si esta sombra desaparece, la bronquiectasia puede evitarse. La mayor parte de las bronquiectasias del lóbulo inferior pueden ser descubiertas en la infancia y en su mayoría en los dos primeros años de la vida. No hay prueba alguna de que muchos de los casos llamados "Enfermedad Quística Congénita" tengan un origen diferente o que los cambios hayan ocurrido en la vida prenatal. No hay razón para sospechar que la dilatación bronquial asociada con tuberculosis posea caracteristicas especiales ó que su patogenia difiera de la patogenia de las bronquiectasias de otro origen. El cambio desde el pulmón normal hacia las variadas formas de dilatación bronquial puede ser observado en radiografías comunes del torax ó en broncografias hechas a intervalos frecuentes. Los rayos X son necesarios para la identificación de las bronquiectasias y para el reconocimiento precoz de la atelectasia que precede a la bronquiectasia.

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Bronchiectasis as a Pediatrician Sees It

JOSEPH BRENNEMANN, M.D.
Los Angeles, California

Bronchiectasis is not bronchiectasis from the start. At least in childhood it is an evolution from a pre-bronchiectatic state that is commonly recognizable and as commonly curable if it is recognized early enough. The present discussion will be limited wholly to that early period and will be concerned chiefly with prophylaxis.

To a pediatrician of long experience two quite unrelated diseases present analogies that seem an appropriate approach to our present subject. The pediatrician, from his unique position at the beginning of so many things pathologic, is today no longer so much interested in phthisis, or "consumption," as he is in that early period of pulmonary invasion known as primary, or childhood, tuberculosis, a period in which the disease can be arrested and remain to all intents and purposes cured clinically if the patient is placed under favorable hygienic conditions and is protected from further exposure. By adding to the usual clinical procedures the data obtained from a history of contact, a positive tuberculin reaction and the all-important x-ray film, he is usually able to diagnose a pulmonary invasion long before that all too late period in which it can finally be made out by percussion and auscultation or by finding the organisms in the sputum or in stomach washings; in short, before the more fateful secondary state has supervened. There has been increasing evidence for some time that one can think of bronchiectasis along similar lines of thought. It often, perhaps predominantly, has its origin in childhood. It, too, is preceded by an earlier stage that can commonly be diagnosed both by the usual procedures of physical examination and, notably, by the aid of the x-ray film, at a time when it is so amenable to treatment if instituted early enough that one can hope to eliminate the danger of an eventual full-blown bronchiectasis. Since the present discussion is based mainly on my own observation and experience in association with Dr. Anspach and Dr. Holinger at the Children's Memorial Hospital in Chicago, I shall omit an extensive scaffolding of references and shall not hesitate to use the unconventional first personal pronoun.

In the past, three apparently isolated clinical entities have been well known and described. Only in more recent times has it become evident that there is an intimate potential cause and effect relationship between them. A brief description of each in its historical and more or less chronological setting may help to clarify our present ideas on the pathogenesis of bronchiectasis.

BRONCHIECTASIS

Bronchiectasis has been known since first described by Laennec in the early part of the nineteenth century as a serious, chronic, peculiarly distressing, disabling, and, until recently, incurable disease of obscure origin. The main clinical features were recognized as chronic cough with periodic expectoration of large amounts of sputum, often excessively foul; occasional hemorrhages; a relatively low febrile course with, however, recurring bouts of fever of varying duration and severity and a course unsatisfactorily influenced by any form of treatment. Nutrition was ultimately affected and death usually occurred long before the average life expectancy was reached due to some intercurrent but associated infection such as pneumonia, sepsis or brain abscess.

Physical signs were recognized as fairly constant within, however, rather wide limits. There was usually some dullness to percussion over one or both lower lobes posteriorly; there were coarse, creaking rales, especially marked on deep inspiration, and either suppressed breathing or such further evidence of consolidation as bronchial breathing and bronchophony, often elicited only after a hard coughing spell. *The heart was characteristically displaced toward the affected side.* The amount of sputum that could be raised after a prolonged interval and the resulting change in physical signs clearly indicated that there was a reservoir of secretions in the affected lobe due either to an abscess or to a dilatation of the bronchi.

Necropsies early, and both x-ray and lobectomy later, have established the essential nature of bronchiectasis as an ectasia of the bronchi varying from a cylindrical to a more advanced saccular dilatation, together with a collapse of the alveoli so that the parenchyma becomes airless, solid and contracted, the *resulting shrinking in size leading to displacement of the heart toward the affected side.* A notable disclosure by the x-ray is the presence of *a triangular shadow at the inner base of one or both lung fields,* sometimes fairly dense and homogeneous, more often less sharply outlined and more or less honeycombed. This appearance once led to the dictum that "the triangular shadow is pathognomonic of bronchiectasis." This view is no longer tenable since other conditions about to be described lead to similar equally, or even more, sharply defined shadows. The information obtained by the injection of radio-opaque oils needs no elaboration other than the statement that it gives the clearest picture of anatomic and pathologic conditions that can be obtained short of lobectomy or necropsy. It is the *sine qua non* in diagnosis. Other lobes than the lower may be involved, especially the middle lobe, either separately or in association with others, but much more rarely.

COLLAPSED LUNG, OR ATELECTASIS

Some sixty years ago William Pasteur, an Englishman, called attention to the occurrence of a "collapse," or shrinking into an airless condition, of a part of a lung in association with post-diphtheritic paralysis. This was naturally attributed to weakness of the respiratory mechanism. That this explanation was probably true in part, but only in part, will be discussed later. Relatively little was said about this condition for many years except that it was known to occur and that it was in some way a sequel to a pulmonary infection. Renewed interest arose in the past two decades especially during and after the first World War. It was observed following non-penetrating wounds of the chest on the ipso-lateral side, presumably due to local respiratory inhibition because of pain. It was soon found, however, that it sometimes occurred on the contra-lateral side, and reports followed in rapid successful of collapse following such operations as appendectomy and herniorrhaphy, indeed after any operation, more specifically, after any general anaesthetic. It is probable that most of the cases of "postoperative pneumonia" belonged in this category. Atelectasis was also reported occurring with asthma; following the inhalation of a foreign body; in patients with general muscular weakness, confirming the earlier observations by Pasteur and, most often, as a sequel to a pneumonia that frequently did not run the usual course.

Any lobe or a whole lung may be involved. If the atelectasis is extensive enough, *the heart is always displaced toward the affected side,* the degree of displacement depending on the amount of lung affected. Examination reveals dullness to percussion, diminished breath sounds or bronchial breathing and bronchophony. *The important diagnostic point is the location of the heart* as made out both by physical examination, and even more, by the x-ray film and fluoroscopy. If a lower lobe alone is collapsed, the most frequent seat of trouble, *the x-ray film will show a triangular shadow at the base of the corresponding lung field* of varying density but commonly more definite than that of the similar shadows seen in bronchiectasis. This brings us to the third clinical entity, practically identical with the other two but only so far as the lower lobe is concerned. It has, however, a different and more recent historical setting.

THE TRIANGULAR SHADOW AT THE BASE OF A LUNG FIELD IN THE X-RAY FILM

For some thirty years scattered reports have appeared in the literature dealing with a triangular density of obscure etiology and nature located at the base of one or both lung fields in the x-ray film. The mesial border of the triangle merges with the shadow of

this phenomenon. This paper may well be rated as "must-reading" to anyone interested in the forces that lead to bronchial dilatation and to bronchiectasis as a whole. It suggests, among other things, that the clinician might well avail himself more often of the resources of the more basic sciences.

According to prevailing evidence, bronchiectasis, at least in children, is nearly always, perhaps always, preceded by atelectasis. Atelectasis occurs whenever there is complete obstruction, either from within or from without, of the lumen of the main bronchus of a lung or of one or more lobes or of a part of a lobe. A lower lobe is much more frequently involved than all of the others combined. Air is absorbed from the alveoli resulting in the shrinking of the affected portion of the lung to a fraction of its normal size. Incomplete evacuation of secretions of high viscosity, or stasis, takes place and this, in turn, leads to infection of the secretions, bronchial walls and to a variable extent of the parenchyma. An "abnormal mechanical dilating stress"[4] is exerted on the bronchial walls that have been weakened by infection and ectasia results. Fibrosis takes place in the parenchyma and according to Andrus this contains dilated, or emphysematous, air cells that give rise to the honeycomb appearance of some shadows in the x-ray film, the clearer areas being due to dilated air cells and not to bronchial dilatations.

BACTERIOLOGY

There is apparently no evidence that any one organism, or a group of organisms, plays a specific role. Diamond and Van Loon[3] backed by the long and intensive experience of the Jackson clinic, state flatly: "The bacteriologic picture is altogether non-specific." They have, moreover, reported finding one or the other member of the fusospirochetal complex in only about 10 per cent of their series of 75 cases of bronchiectasis in children and have found "no relation between the presence of fusospirochetal organisms and the character or odor of the bronchial exudate." This is in striking contrast to the reports of many other observers by whom the foul odor is linked to these organisms and who attribute to them a much higher incidence, Smith[5] especially, finding them in over "80 per cent of his adult patients with dilatations."

PARANASAL SINUSITIS

Nearly all observers have reported a very frequent association of paranasal sinus infection with bronchiectasis and it is commonly accorded a role as an etiologic and supporting factor. It is perhaps hazardous in the present state of our knowledge and theory concerning the subject even to question this view and yet to this

pediatrician the thought still occurs that the sinusitis may as well be a result as a cause of, or a maintaining factor in, the pulmonary disease.

TYPES OF ATELECTASIS

If bronchiectasis is preceded by atelectasis and atelectasis is brought about by obstruction of the lumen of a bronchus it is of practical interest in this connection to review briefly the main types of atelectasis, not only to discuss the conditions under which each occurs but also to point out that in each case there is an obstruction and that its nature can usually be made out. Obviously obstruction can come from without or from within the lumen of the bronchus. The former is relatively rare and is most often due to pressure from a tumor, a gland, a congenital heart, or some inflammatory process.

The simplest and most tangible demonstration of an obstruction within the lumen is furnished by the inhalation of a foreign body. As Chevalier Jackson has pointed out, a metallic or radio-opaque foreign body may remain in situ for a long time without causing either bronchiectasis or an abscess. Pulmonary reaction occurs rapidly with a foreign body of vegetable origin, notably with the greatest offender of all, the peanut kernel, and either bronchiectasis or abscess, or both, is inevitable if it remains long enough.

Probably the most frequent cause of obstruction is secretions from the bronchi which Jackson, Diamond and Van Loon[3] and others have shown to be of peculiarly high viscosity, especially in the early stages of atelectasis. There is fairly common agreement that the collapse is usually ushered in by "pneumonia." Anspach[2] from his experience with a large material followed over a long period of time has a somewhat different slant on the nature of the primary infection in the lung: "The history common to the majority of cases is that of an acute pulmonary process at the onset. Elevation of temperature, which was frequently preceded by a chill, reached from 103° to 105° F. The physical findings approached those of lobar pneumonia. There was usually an early decrease of breath sounds near the base of the involved side. Moist rales were frequently heard. By the end of forty-eight hours the temperature usually dropped, often suddenly, and from that time on was seldom elevated more than 1 degree. It was sometimes subnormal."

Nowhere is obstruction due to secretions shown more strikingly than in cases of laryngo-tracheobronchitis. At any time in the course of this treacherous disease the child may show symptoms of increased respiratory distress due to collapse of one or more lobes. Removal of thick, tenacious, ropy secretions, or of an inspissated crust, by means of negative pressure suction or bronchoscopic as-

piration will usually be followed promptly by a return to the former condition.

In postoperative collapse there is an accumulation of secretions probably due to an obtunding, or abeyance, of the cough reflex and possible bronchial irritation from the anaesthetic. This is confirmed by the fact that such collapse usually ends in a short time either spontaneously or through early induced hyperventilation; even more promptly through bronchial aspiration. The latter is indicated less frequently here than in some other types of collapse. In only 5 of 21 cases of postoperative collapse observed by Molony,* was bronchoscopic aspiration employed.

A number of observers[6,7] have reported fairly large series of cases of atelectasis occurring during attacks of asthma. Bronchial obstruction in such patients is probably brought about by a combination of bronchospasm; thick tenacious secretions characteristic of asthma and, possibly, thickened bronchial walls.

Atelectasis and ultimate bronchiectasis have been reported due to obstruction from intra-bronchial tumors, granulation tissue, etc.

There is a potential cause of massive collapse that has not received the attention it deserves. I refer to any disease in which there is marked generalized muscular weakness. It will be recalled that attention was first called to this by Pasteur in connection with post-diphtheritic paralysis. It is probable, as pointed out by Jackson, that bronchial occlusion due to membrane plays at least an equal role as shown by the favorable results from treatment by suction. I, too, have seen massive collapse in post-diphtheritic paralysis, but also in pseudo-hypertrophic muscular dystrophy, poliomyelitis and acrodynia. Some of us have long taught that patients with acrodynia, usually infants, should not be sent into a hospital ward because of the danger from respiratory infections. One such infant died in a hospital many years ago, as I then thought of lobar pneumonia. At a later time another presented like findings. This time the ante-mortem diagnosis of massive collapse was confirmed by necropsy. In these patients we have a combination of muscular weakness, possibly too prolonged lying on one side and a resulting accumulation of exudate that cannot be coughed up effectively. The condition in all of these patients with great muscular weakness is peculiarly serious since the basic etiology remains unaltered.

TREATMENT OF BRONCHIECTASIS IN CHILDREN

The treatment of bronchiectasis naturally falls under three heads: Prevention, palliation and cure.

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*Personal communication.

PREVENTION

Since much of bronchiectasis can be prevented by the early recognition and cure of atelectasis, the primary responsibility rests with the general practitioner and the pediatrician who stand in the first line of defense. Both the nature of atelectasis and the conditions under which it may arise must be kept in mind in the presence of any suggestive pulmonary episode. *In any doubtful case the help of the roentgenologist must be enlisted.* From what has been said it is evident that not all cases are of like urgency. The foreign body should be removed at once, the postoperative collapse may clear up in a day or two. In general, however, the earlier the treatment the surer the outcome. Keeping the patient on the nonaffected side, inducing hyperventilation early, may be all that is necessary in some cases. If there is no improvement in a short time, the length of the period of waiting depending on the nature of the obstruction, bronchoscopic aspiration should be instituted and repeated as often as seems indicated until the affected area is cleared. Whether expert bronchoscopy is available, or not, must be thrown in the balance in deciding what course to pursue. Unfortunately its general and practical availability is still limited.

PALLIATION

There is fairly general agreement that bronchiectatic dilatations cannot be made to revert to normal. In the cases in which this has seemed to occur Diamond and Van Loon[3] suggest that "in all likelihood it is due to restoration of the previously crowded, shortened, club-like bronchi to their normal length and position rather than to their recovery from true bronchiectasis." The same authors question the view of Anspach and others, including myself, that dilatations tend to increase in size in the course of time. Perhaps the discrepancy can be explained by the fact that Anspach saw most of the patients he reported after long periods of absence of all treatment while they may have drawn their conclusions from patients under more constant treatment.

Postural drainage has an ameliorating effect if properly carried out and should always be employed. The patient must lean over the edge of the bed so that the trunk forms an angle of at least 45°. He should cough vigorously for several minutes while in this position, two or three times a day. This is not nearly as effective as bronchoscopic aspiration as can readily be demonstrated by the amount that can be aspirated after postural drainage and by the greater immediate and prolonged relief. Whether palliative treatment shall be continued or surgery instituted will naturally depend on the availability of expert bronchoscopy on the one hand and of

expert surgery on the other, and ultimately, even more, upon the condition of the patient. No fixed rule can be laid down.

CURE

It can probably be stated with assurance that there is no cure for an established case of bronchiectasis except that offered by surgery. The remarkable advances along this line in recent years have made lobectomy and even pneumonectomy, one of the less hazardous procedures and one that can be entered upon with the hope that a cure can be obtained in the great majority of instances at the hands of the expert thoracic surgeon.

4614 Sunset Boulevard.

SUMMARY

Only in more recent times has it become evident that there is an intimate cause and effect relationship between three apparently isolated clinical entities. These three, bronchiectasis, the collapsed lung, or atelectasis, and the triangular shadow at the base of the lung in the x-ray film have been well known and described. The one etiologic factor common to all three entities is complete obstruction of the lumen of the main bronchus of a lung or of one or more lobes or of a part of a lobe.

Bronchiectasis, at least in childhood, is an evolution from a prebronchiectatic state that is commonly recognizable and as commonly curable. Bronchiectasis is nearly always preceded by atelectasis and atelectasis occurs whenever there is complete bronchial obstruction. Much of the bronchiectasis can be prevented by the early recognition and cure of atelectasis through the relief of bronchial obstruction. The removal of foreign bodies, the bronchoscopic aspiration of obstructing secretions and postural drainage are all indicated as preventive measures. Surgical removal of the diseased lobe or lung offers the only certainty of cure for an established case of bronchiectasis.

RESUMEN

LA BRONQUIECTASIA VISTA POR UN PEDIATRA

Recientemente se ha hecho evidente que hay una íntima relación de causa y efecto entre tres entidades clínicas aparentemente aisladas. Estas tres; bronquiectasia, el pulmón colapsado o ateléctasia y la sombra triangular en la base de un pulmón a la imagén radiográfica han sido bién conocidas y descriptas. El solo factor etiológico común a estas tres entidades es la completa obstrucción de la luz

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No illustrations have been used for this article because they will doubtless be supplied by others in the symposium.

de un bronquio principal, de uno o mas bronquios lobulares o de algunos de los bronquios de un lóbulo.

La bronquiectasia, al menos en la niñez, es la evolucion de un estado, pre-bronquiectásico que es comunmente reconocible y usualmente curable. La bronquiectásia es casi siempre precedida por atelectasia y ésta existe donde hay una completa obstrucción bronquial. Muchas de las bronquiectasas pueden ser evitadas por un reconocimiento precóz y la cura de la atelectásia por el alivio de la obstrucción bronquial. La extracción del cuerpo extraño, la aspiración broncoscópica de secreciones obstruyentes y el drenaje postural están indicadas como medidas preventivas. La extirpación quirúrgica del pulmón enfermo, ofrece la única seguridad en la cura de una bronquiectásia ya establecida.

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Nasal Sinusitis in Relation to Bronchiectasis: A Review

FRANCIS L. LEDERER, M.D., F.A.C.S.*
Chicago, Illinois

Investigators generally are agreed that infection in one or more of the nasal sinuses may be the source of lingering bronchial or pulmonary disease, even though it is not always possible to determine a positive relationship. Goodale's[1] searching analysis of 75 cases demonstrated this fact for he was unable to establish a definite relationship to sinusitis in 65 per cent. In 32 cases, however, he did not hesitate to attribute the pulmonary condition to a preceding infection of the upper part of the respiratory tract. Walsh and Myer[2] found sinus disease in association with bronchiectasis in 66.8 per cent of 217 cases. Of 712 case records of bronchiectasis reviewed at the Massachusetts General Hospital, Adams and Churchill[3] concluded that there was an associated sinusitis in 90 per cent. In spite of this, however, they are unwilling to admit the etiologic sequence in all instances.

ROUTES OF INFECTION

While such sequence cannot always be determined, improvement of the bronchiectasis frequently follows therapy of the existing sinusitis. In the light of existing methods, the diagnosis of bronchiectasis *per se,* is not difficult. Determination of the etiology, however, represents a more complicated problem. This is well borne out even in routine cases in which no hard and fast rules can be laid down. The importance of individualized study, therefore, cannot be too strongly emphasized. It is not unusual for a diagnosis of bronchiectasis to be delayed until the existence of a sinusitis is established. Brock and Bell[4] call attention to this, because they found that in some patients of a group of 44 which came under their observation, the bronchiectasis was not diagnosed until after the sinusitis had been uncovered.

Latent or so-called occult sinusitis is frequently the cause of a wide variety of diseases in remote parts of the body. Since it is well known that the mucosa throughout the respiratory tract is similar, it is not difficult to explain how infection from the upper part of

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*Lieutenant Commander, MC-V(S) USNR, U. S. Naval Hospital, Philadelphia. The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Naval Department or the Naval Service at large.

the tract may involve the lower part. The two principal routes of infection by way of the respiratory tract are through aspiration or by ways of the lymphatics. Butler[5] believes that the former route is the more frequent one. Whelan[6] is of the same opinion, and he, like so many other authors, testifies to the benefits of proper treatment of sinus conditions which were more or less dormant. In the final analysis, according to Smith,[7] mechanical obstruction and infection are the essential factors in the production of bronchiectasis. If this be true, bronchiectasis can well be explained as a secondary or late complication of a preceding disease like nasal sinusitis.

DIAGNOSIS

In the light of our present knowledge every patient with a potential pathologic process in the chest should be given the benefit of roentgen examination not only of the chest but also of the nasal sinuses. In nontuberculous pulmonary conditions nasal sinusitis is not infrequently the forerunner of the pathologic process in the lower respiratory tract.

So-called latent or silent sinusitis which occasionally is undiagnosed in the ordinary film usually is detected by the use of radiopaques. It is this type of sinusitis that not infrequently precedes a bronchiectasis.

Diamond and Van Loon[8] in a rather comprehensive review of the subject found that the incidence of sinus disease varied according to the age of the patient, being decidedly lower in infants than in older children. "Coexisting sinusitis was noted in only 44 per cent of the children seen before the age of 5 years, whereas it was found in 66 per cent of those whose condition was diagnosed at a more advanced age." Since their study was on bronchiectasis in children, Diamond and Van Loon investigated the finding of nasal sinusitis in this group as compared with those in the tracheobronchitic group. The incidence was 64 per cent in the former and 61 per cent in the latter. While rarely a sinusitis may not make its appearance for a long time after a bronchiectasis is diagnosed, as a general rule the sinusitis if carefully sought for will be found at the time of the bronchographic diagnosis.

The observation of Clerf[9] and Goodale[10] of the frequent presence of sinus infection in association with bilateral bronchiectasis, in contradistinction to its frequent occurrence with unilateral dilatation, is highly confirmatory of an etiologic relationship between the sinusitis and the bronchial disease if doubt has heretofore existed of such a relationship. This correlation did not obtain in the children studied by Diamond and Van Loon.

It is interesting to recount the fact that the severity of the symptoms of bronchiectasis is often in relation to the severity of the

nasal sinusitis. Graham's[11] observation that shortly after the onset of the sinusitis the bronchial mucosa became inflamed promptly attests to the significance of controlling the sinus infection in bronchiectatic disease.

The possibility of allergy playing a role in bronchiectasis has recently been considered by some workers. Watson and Kibler[12] analyzed a number of patients with bronchiectasis sent to Arizona for the climate and found 90 per cent of them to be definitely allergic. They divide the disease into three types: (1) congenital bronchiectasis, (2) mechanical bronchiectasis, as from tuberculosis, fibrous pleurisy or pulmonary fibrosis, and (3) allergic bronchiectasis. Watson and Kibler believe that if the allergic causation were recognized and the allergy treated early enough, the irremediable pathologic changes of the late condition could in many instances be prevented. Is it likely that the allergy referred to might be an associated factor in the focal sinusitis with which this paper is mainly concerned?

In Diamond and Van Loon's study of bronchiectasis in children, allergic manifestations were comparatively uncommon. Only 3 had asthma and recurrent urticaria. In the tracheobronchitic group, on the other hand, 13 were asthmatic, 3 had chronic eczema, 1 had hay fever and 1 had rose fever. In all of these the allergy was established at the time of the bronchographic diagnosis.

Hansel[13] has called attention to the fact that chronic bronchial irritation, characterized by cough and the expectoration of mucus, may be a manifestation of allergy. Duke[14] emphasizes the importance of differentiating between allergic bronchitis and pulmonary tuberculosis, chronic bronchitis or bronchiectasis. The cytology of the bronchial secretions, according to Hansel, is of indispensable value in establishing the diagnosis.

TREATMENT

The therapy of bronchiectasis of sinus origin resolves itself into (1) management of the sinusitis; (2) management of the bronchial disease.

In the management of the sinusitis various opinions have been expressed concerning conservative and radical measures. In children, radical operative procedures on the sinuses are rarely necessary. In the group studied by Diamond and Van Loon only 3 children required radical operations, the remainder responding to conservative measures.

Obviously, there can be no set rules as to conservative or radical therapy. The subject is still controversial at the present time between two schools of thought: the one which leans to a thorough

trial of conservative treatment unless the pathologic process is unquestionably remediable by surgical procedure; and the other which believes that only by operation can a cure be effected.

That the end results of nasal and sinus surgery are far from satisfactory has been exposed in a recent paper by Hollender[15] who showed that the average of cures from nasal surgery was 71 per cent; from sinus surgery 42 per cent. In cases of sinusitis related to bronchiectasis surgical intervention should be resorted to on the basis of existing indications and not on the set assumption or belief that one form of therapy is superior to the other. In borderline cases hasty surgical intervention without adequate trial of non-surgical treatment may prove erroneous and an unnecessary hardship on the patient. When, however, operation seems justifiably indicated, "the operation should be selected for the patient and not the patient for the operation." The viewpoint that we must not adhere too strictly to classic procedures is quite rational. The experienced rhinologic surgeon should be qualified to alter his technic and plan of procedure to meet the problem at hand. Only by such departure from classic methods will successful results be obtained in sinusitis by surgery even though positively indicated.

In obviously non-surgical conditions and in borderline cases, resort should be had to those methods which will first of all improve nasal ventilation and drainage. In some instances shrinkage and suction may be all that are necessary. In others, sinus lavage may be required. Displacement, syfon therapy and physical measures, either singly or in combinations, will prove effective in properly selected cases. It should be remarked that these are purely local measures and that heliotherapy, climatotherapy, vitamins, sera, foreign proteins are frequently valuable supplementary general therapeutic agents.

The bronchiectasis itself is best managed by cooperation between the internist and the bronchoscopist. Postural drainage and bronchoscopic aspiration are important and effective therapeutic measures. The latter lends itself for aspiration of pus and injection of iodized oil to determine the size of the cavities. If desired, medicaments can be introduced.

The use of chemotherapy merits a trial but sufficient data have not yet been accumulated to judge the value of the sulfonamide drugs in bronchiectatic disease. Others forms of drug therapy are occasionally indicated to meet symptomatic indications, but in general it may be said that they possess no curative value.

Finally, the treatment of bronchiectasis resolves itself into a cooperative effort on the part of the rhinologist, bronchoscopist, internist and surgeon.

SUMMARY AND CONCLUSIONS

1) Bronchiectasis and other forms of pulmonary disease may have their sources in one or more of the nasal sinuses.

2) The fact that therapy of an existing sinusitis not infrequently leads to improvement of a bronchiectasis seems to establish an etiologic relationship, more especially since it is well known that the mucosa throughout the respiratory tract is similar.

3) The diagnosis of latent sinusitis in the presence of bronchiectatic disease is greatly facilitated by recently perfected procedures such as the use of radiopaques.

4) The role of allergy in bronchiectasis must be duly considered in the light of recent observations.

5) If, as seems reasonable to assume, sinusitis is an important etiologic factor in a large number of cases of bronchiectasis, treatment of the latter must at the same time rationally include adequate management of the existing sinus disease.

RESUMEN

SINUSITIS NASAL EN RELACION A BRONQUIECTASIA: UNA REVISTA

La bronquiéctasia y otras formas de enfermedades pulmonares, pueden tener su origén en uno o más de los senos nasales.

El hecho que el tratamiento de una sinusitis existente no rara véz lleva a la mejoria de una bronquiéctasia parece establecer una relación etiológica, mas especialmente desde que es bien conocida lo semejante que es la mucosa a travéz del arbol respiratorio.

El diagnóstico de sinusitis latente en la presencia de una enfermedad bronquiectásica es facilitada en gran parte por los procedimientos perfeccionados recientemente tales como el uso de radiografias de contraste.

El rol de la alergia en bronquiectasias debe ser debidamente considerada a la luz de recientes observaciones.

Como parece razonable suponer, la sinusitis es un importante factor etiológico en un gran número de casos de bronquiectasias el tratamiento de esta última debe al mismo tiempo incluir un tratamiento adecuado de la enfermedad del seno.

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Bronchoscopy in Bronchiectasis

LOUIS H. CLERF, M.D.
Philadelphia, Pennsylvania

The employment of bronchoscopy in diagnosis and the use of iodized oil to aid the roentgenologist in visualizing the tracheobronchial tree have added greatly to our knowledge of bronchiectasis and also have changed our concepts regarding the frequency, prognosis, treatment and prevention of this condition.

General Considerations—To more fully appreciate the importance of bronchiectasis the following general considerations are presented.

1) Bronchiectasis is a common chronic pulmonary disease being more often observed than pulmonary tuberculosis.

2) Bronchiectasis involves the peripheral portion of the bronchial tree, commonly involving a lower lobe and more often the lower lobe of the left lung.

3) Bronchiectasis is common in children and while it may be congenital in origin, in a majority the disease is acquired and is secondary to previous bronchopulmonary infection.

4) The morbidity and mortality rate of bronchiectasis are higher than is generally appreciated.

5) While there are many predisposing etiological factors the occurrence of bronchiectasis is dependent on the presence of infection and interference with drainage. Bronchial infection and obstruction are the most important etiological factors.

6) The treatment of well established bronchiectasis is unsatisfactory. Surgical extirpation of the diseased lung tissue will effect a cure. All other methods of therapy are palliative only. The greatest field of usefulness for the physician lies in prophylaxis, namely the recognition of bronchial infection and bronchial obstruction and the prompt application of corrective measures.

While there is no statistical evidence bearing on the frequency of bronchiectasis there is little question that a majority of patients afflicted with so-called winter bronchitis or chronic bronchitis have bronchiectasis. Investigation of small groups of these cases by bronchoscopy and by instillation of iodized oil have indicated that bronchiectasis is present. I am convinced that if a cross section of the population was studied in this manner the number of cases found with bronchiectasis would be astounding. Chest clinics which have available a bronchoscopic department and utilize iodized oil for lung mapping find a very high incidence of bronchiectasis.

While bronchiectasis may be congenital in origin, the majority

of cases are unquestionably acquired. It is not a primary disease being secondary to previous infection and often obstruction, notably bronchopneumonia or pneumonitis which has not undergone prompt resolution but has resulted in changes in the bronchial wall with replacement of the normal elements by fibrous tissue, and ultimately bronchiectasis.

The changes commonly occur in the periphery of the lung, that is the smaller bronchi. Larger bronchi do not become involved until the process is quite extensive. A diagnosis of bronchiectasis therefore cannot be made bronchoscopically on the basis of comparing the size of bronchi with previously observed cases or comparing the bronchi of one lobe with those of another. The changes usually are insignificant, in fact with inflammatory changes involving the mucous membrane it is probable that the lumen of the bronchus as visualized bronchoscopically is smaller than normal.

Etiology—Bronchiectasis is common among children particularly among those who have suffered from measles or whooping cough. This has not been generally realized. Examination of the lungs is not so readily accomplished in children and it is more difficult to instill iodized oil into the tracheobronchial tree; consequently this procedure is carried out more often among adolescents and adults and the impression gained is that bronchiectasis is more common in adults than in children. Every child who has a chronic cough whether productive or not should not only have a bronchoscopic examination but iodized oil also should be instilled for lung mapping. The incidence of bronchiectasis among children with chronic cough is high. Prompt recognition of this is important if any benefit is to be derived from conservative treatment.

While much has been written concerning the etiology of bronchiectasis, it is believed that all of the predisposing factors can be resolved into two, namely infection of the bronchi and bronchial obstruction. Pneumococcal lobar pneumonia which undergoes resolution promptly is rarely complicated by bronchiectasis. Certain metallic foreign bodies which produce slight bronchial obstruction with no bronchial infection rarely are complicated by bronchiectasis. On the other hand, patients who have had pulmonary infection which has not undergone prompt resolution or those who have bronchial obstruction with infection distal to the point of obstruction frequently develop a complicating bronchiectasis. Whether this can be cleared up promptly under appropriate treatment depends upon the duration of the infection and obstruction. The child with measles or whooping cough with a complicating bronchopneumonia frequently has bronchial obstruction in the nature of thick tenacious secretion which cannot be coughed up. The same factors are operative in the case of postoperative massive atelectasis which is not

recognized as atelectasis and is treated as a postoperative pneumonia. Similar mechanical factors are observed in cases of aspirated foreign body with retention of secretion and drowned lung distal to the obstruction. All patients with pulmonary infection should therefore be studied from the standpoint of bronchial obstruction resulting from retention of secretions.

The bronchoscopic findings vary. Bronchiectasis may appear as the infected form with purulent secretion and inflammatory changes or the dry form. In dry bronchiectasis there may be nothing abnormal noted bronchoscopically unless the examination is carried out shortly after the patient has had hemoptysis when there will be observed blood tinged secretion coming from one or more bronchial subdivisions. There is practically no change in the mucosa itself; the orifices of bronchial subdivisions appear normal and there is no apparent dilatation. In this type it is important to do a bronchoscopy promptly after hemoptysis so that blood tinged secretion may be traced to its lobar origin. Then iodized oil should be instilled into the involved portion of the lung and the bronchi demonstrated roentgenologically. The presence of small flakes of secretion may be of no significance whatsoever.

Bronchiectasis also may be of the nonobstructive or the obstructive forms. In the nonobstructed infected case changes in the mucosa commonly are observed. There is thickening and congestion with an absence of the normal ring markings; often purulent or mucoid secretion may be seen coming from one or more of the bronchial subdivisions. Very often there is a diminution in the size of the orifices of the bronchial subdivisions in spite of the fact that the bronchi are dilated. This is due to thickened mucosa which encroaches upon the bronchial lumen and further, it has been demonstrated that often there is enlargement of the small lymph nodes in the interbronchial spaces immediately at the angle of bifurcation. These encroach upon the bronchial orifices and add to the narrowing. It is a common experience in known cases of lower lobe bronchiectasis to find the orifices of the bronchial subdivisions more or less slit-shaped with their long axes in the sagittal plane. During cough and forced expiration these diminish in size so that there is interference with evacuation of the accumulated secretions from the dilated bronchial subdivisions.

In the obstructed form of bronchiectasis the bronchoscopist observes the obstruction together with mucosal changes which are dependent upon the type of obstruction. If the obstruction consists of masses of thick secretion as in postoperative atelectasis, the mucosal changes consist only of inflammatory thickening. In cases of foreign body it is not uncommon to observe inflammation and masses of granulation tissue particularly if the foreign body pre-

sents a rough exterior. Bronchial neoplasms particularly adenoma may obstruct a bronchus and also interfere with drainage of secretions. In these one observes the tumor which often appears granular and pus is found proximal as well as distal to the obstruction. Additional findings in obstructive bronchiectasis may be stricture, endogenous foreign bodies as broncholiths and compressive stenosis. Bronchiectasis often is observed during the latter stages of carcinoma of a bronchus.

While cough may exert some influence on the production of bronchiectasis, this undoubtedly is of secondary importance. Studies of patients with chronic nonproductive cough often reveal pulmonary emphysema with usually no evidences of bronchietcasis as shown by lung mapping. It would seem that cough itself does not produce bronchiectasis unless there is weakness of the bronchial wall due to previous infection. It is probable, however, that in obstructive emphysema associated with infection distention of the lung distal to the obstruction may lead to bronchiectasis

Lung Mapping—While a diagnosis of bronchiectasis often can be made on the basis of the history, clinical examination and roentgen study, if surgical treatment is contemplated a final diagnosis should be based on a roentgen study of the bronchial tree following instillation of iodized oil. This may be introduced by one of many methods. The important consideration in employing iodized oil is to introduce it into the desired portions of the lung to be studied and to retain it there sufficiently long so that appropriate roentgen studies can be made. The catheter method introducing the tube by mirror laryngoscopy in adults is the most satisfactory while in children the catheter may be introduced by direct laryngoscopy. Instillation of a sufficient quantity of local anesthesia solution preceding introduction of the catheter is necessary. In children preliminary sedation may be required. These procedures are best carried out under fluoroscopic guidance so that the roentgenologist may indicate when a sufficient quantity of oil has been introduced into a particular portion of the lung. Roentgen studies may then be made before the oil has changed its position, has passed into the periphery of the lung or has been coughed up. This diagnostic aid is most important to ascertain the presence or absence, extent and character of bronchiectasis.

Prophylaxis—Bronchoscopy should be considered as an important aid in the prevention of bronchiectasis whenever there is bronchial obstruction, produced not only by aspirated foreign body or new growth but also due to the accumulation and retention of secretions. Secretions often cannot be gotten rid of either because the material is too heavy to be dislodged by an otherwise effective cough or because the patient's cough reflex and expulsive efforts are too feeble

due either to weakness of the patient or to the administration of cough sedatives. Such an indication may appear to be broad and all-inclusive but it must be borne in mind that secretions allowed to remain in a bronchus for a considerable time, will produce additional inflammatory changes in the bronchial wall and this may be the first step in the etiology of bronchiectasis. It would appear necessary therefore that all patients, particularly children suffering from bronchopulmonary infection associated with the production of considerable secretions, should be observed frequently by the pediatrician to ascertain if there is present bronchial obstruction. In addition, roentgen study particularly fluoroscopic examination is indicated to ascertain if there is interference with ventilation and drainage of any particular portion of the lung. In the event that obstruction with retention of secretion has occurred and cannot be relieved by the commonly accepted measures within a reasonable period of time removal by bronchoscopy or aspiration with the aid of a catheter introduced into the tracheobronchial tree is definitely indicated.

Bronchial Obstruction—All forms of bronchial obstruction which interfere with drainage of secretions develop a condition called "drowned lung" distal to the obstruction. This is observed in bronchial foreign body, new growth, benign or malignant, bronchial stricture and compression stenosis and very often is erroneously diagnosed as "unresolved pneumonia." A majority of patients diagnosed as unresolved pneumonia had bronchial obstruction which was erroneously considered as pneumonia. The prolonged delay in arriving at a correct diagnosis and failure to remove the bronchial obstruction promptly has resulted in extensive pulmonary suppuration and fibrosis with permanent changes in the bronchial walls and bronchiectasis.

The occurrence of bronchial obstruction during the course of or following pneumonia calls for prompt bronchoscopic investigation. Furthermore, the presence of symptoms, physical signs or roentgen findings which suggest bronchial obstruction should demand prompt study. Bronchial obstruction usually does not clear up spontaneously. Obstruction leads to retention of secretion with ultimate infection of the lung distal to the obstruction and bronchiectasis. Prompt recognition with removal of obstruction and improvement of drainage will prevent bronchiectasis.

Treatment—While bronchiectasis probably can be cured by conservative measures, this can be considered only if the cases are observed early before the bronchial mucosa or bronchial wall has been damaged by the infective process. Excellent results have been obtained in patients with minimal bronchiectasis secondary to aspirated foreign bodies. Following removal of the foreign body and

repeated bronchoscopic aspiration of secretions there has been observed very definite regression of the bronchial dilatation. Too often, however, the diagnosis is not made sufficiently early to permit such a plan of treatment. Patients commonly present themselves with well defined bronchiectasis which may involve one or more pulmonary lobes or may involve both lungs.

It is generally believed that when marked tissue changes have occurred in the bronchial wall there is no plan of therapy other than surgical extirpation that can be considered curative. Unfortunately many of these patients either are too old, have bilateral lesions or exhibit other conditions which render surgical treatment impractical. Bronchoscopy unquestionably has a place in the medical management of these cases. Bronchoscopic aspiration of secretions from the infected areas carried out at intervals of one, two or more weeks will often give temporary relief. Many forms of medication have been instilled bronchoscopically. These have included the dyes and certain of the sulfonamides introduced either in powder form or in solution. There is considerable question whether these exert any beneficial effect. It is my impression that normal saline solution is as effective as any. About 5 to 10 cc. of solution are instilled through the bronchoscope into the involved bronchi after pus has been aspirated. It is important to instruct patients concerning postural drainage. This must be considered in the individual case as not every position will suit each patient. Every endeavor also should be made to minimize the frequency of upper respiratory infection and to correct such infections as may exist. Autogenous vaccines seem to be helpful.

In spite of all our efforts, however, the patient with bronchiectasis who cannot be treated surgically is confronted with a serious problem. Many cases of bronchiectasis could be prevented if bronchial obstruction was recognized promptly and corrected. Bronchoscopy offers a means of diagnosis to ascertain if there is present obstruction and infection and also affords a method of treatment for removal of obstruction. In bronchiectasis prevention is more important than cure.

SUMMARY

Bronchiectasis is a common chronic pulmonary disease being more often observed than pulmonary tuberculosis. It involves the peripheral portion of the bronchial tree, commonly involving a lower lobe and more often the lower lobe of the left lung. It is common in children, and while it may be congenital in origin, in a majority the disease is acquired and is secondary to previous bronchopulmonary infection. The morbidity and mortality rate of bronchiectasis is higher than is generally appreciated. Bronchial infection

and obstruction interfering with drainage are the most important etiological factors. Surgical extirpation of the diseased lung tissue will effect a cure. All other methods of therapy are palliative only.

The bronchoscopic findings vary. In dry bronchiectasis there may be nothing abnormal noted bronchoscopically. In the infected form purulent secretion, inflammatory changes or bronchial obstruction may be observed. However, the final diagnosis is based on a roentgen study of the bronchial tree following instillation of iodized oil by one of numerous methods described.

Considerable stress is laid on the importance of bronchoscopy as an aid in the prevention of bronchiectasis through the removal of bronchial obstruction. Bronchoscopic aspiration of secretions from infected areas aids patients who are too old for surgery or who have bilateral lesions which render surgical treatment impractical.

1530 Locust Street.

RESUMEN

LA BRONCOSCOPIA EN BRONQUIECTASIA

La bronquiectásia es una enfermedad crónica común del pulmón siendo más amenudo observada que la tuberculosis pulmonar. Ella compromete la porción periférica del árbol bronquial, comunmente tomando un lobulo inferior y mas frecuentemente el lobulo inferior del pulmón izquierdo. Ella es común en niños y aunque puede ser congénita en origen en general es adquirida y secundaria a una infeccion broncopulmonar previa. La tasa de morbilidad y mortalidad en las bronquiectasias es más alta de lo que generalmente se considera. Las infecciones y obstrucciones que impiden el drenaje son los más importantes factores etiológicos. Curará solo por la extirpación quirúrgica del tejido pulmonar enfermo. Todos los otros métodos terapeúticos son solo paliativos.

Los hallazgos broncoscópicos varian. En las bronquiectasias secas nada anormal puede notarse a la broncoscopia. En las formas infestadas de secreción purulenta, cambios inflamatorios o obstrucción bronquial pueden observarse. Sin embargo el diagnostico final esta basado en el estudio radiográfico del arbol bronquial siguiendo la instilación de aceite yodado por algunos de los numerosos métodos descriptos.

Se acentúa la importancia considerable de la broncoscopia como una ayuda en la prevención de bronquiectasias por la supresión de la obstrucción bronquial. La aspiración broncoscópica de las secreciones desde el area infestada alivia a los pacientes demasiados viejos y a los que tienen lesiones bilaterales en donde los tratamientos quirúrgicos son impracticables.

Surgical Treatment of Bronchiectasis

MICHAEL DE BAKEY, M.D., *and* ALTON OCHSNER, M.D.*
New Orleans, Louisiana

Directing attention to the fact that anatomists and pathologists had "entirely overlooked" the condition, Rene Laennec,[34] in 1819, originally described the characteristic clinical and pathological features of bronchiectasis. During the century following his brilliant contribution little trenchant knowledge was added to the bewildering pathogenesis and the difficult management of this physically and psychologically debilitating disease. In distinct contrast is the remarkable and fairly recent progress that has been made in the diagnosis and treatment of bronchiectasis through the unified and assiduous efforts of physiologists, radiologists, bronchoscopists, anesthetists, and thoracic surgeons. Strikingly illustrative of this consequence of co-ordination is the spectacular improvement in the operative mortality which has dramatically fallen from over 50 per cent to less than 5 per cent. Thus, within the brief span of approximately two decades this once mystifying and seemingly hopeless chronic pulmonary affection now may be readily recognized clinically and effectively treated surgically.

In order to permit a better comprehension of the management of bronchiectasis and to establish the rationale of early surgical intervention, the insidious development, irreversible pathologic features, natural prognosis and morbidity, and the limitations of conservative therapy deserve consideration. Whereas the etiology and pathogenesis of bronchiectasis remain controversial considerable evidence has accumulated to indicate the pathogenic significance of bronchial obstruction. Undoubtedly this may be due to a number of mechanical influences but one of the most frequent forms seems to be an inflammatory bronchial stenosis associated with upper respiratory infections commonly manifested in childhood as repeated "attacks" of pneumonia but actually due to atelectasis consequent to retained and obstructing secretions.[28] By correlating the progressive clinical and roentgenographic manifestations with the corresponding endoscopic features this "pre-bronchiectatic" stage has been demonstrated.[4,27,28,41,59,67] Although there is evidence in some cases to indicate a congenital basis, in the majority a normal lung exists at birth and bronchial dilatations are acquired probably as a result of mechanical obstruction and infection. Previously the

*From the Department of Surgery, School of Medicine, Tulane University; and the Ochsner Clinic, New Orleans, La.

acquired form has been considered a disease of middle age but more recent studies have clearly demonstrated the significant fact that its insidious development usually begins in early childhood.[9,17,20,25,29,36,37,47,48,50,51,66,68] The importance of this realization lies in the fact that by its early recognition and the institution of appropriate measures the progressive development of the disease can be effectively controlled.

Whereas no attempt will be made to discuss the pathologic characteristics of bronchiectasis, some concept of this process will permit a better understanding of the rationale of surgical therapy. In addition to the bronchial dilatations the pathologic process includes destruction of the elastic fibers and muscle bundles of the bronchial wall with extensive fibrous tissue replacement, ulcerative atrophic and hyperplastic mucosal alterations, and varying degrees of chronic inflammatory changes, infiltration, and fibrosis in the surrounding peribronchial tissue and parenchyma. The irreversible character of this pathologic process is evident and it becomes obvious that no method of conservative therapy will restore normal bronchial and parenchymatous structures which have been replaced by fibrous tissue. Although it is agreed that considerable symptomatic improvement may be obtained by drainage of secretions and decreasing infection,[37,46-51,65] the fundamental pathologic changes remain and can be removed only by extirpation.

A real concept of the natural prognosis and morbidity of bronchiectasis and the limitations of conservative therapy also permit a better comprehension of the rational basis of surgical therapy. The previous idea that bronchiectasis is spontaneously curable is no longer tenable and the grave natural prognosis and devastating morbidity of the disease have been conclusively demonstrated by numerous investigators. Of 12 patients observed by Findlay and Graham[20] up to 12 years after onset, 9 had died and subsequent studies[21] on 32 cases emphasized further the gravity of the disease. Of 101 patients with bronchiectasis treated conservatively and followed for a period of three to six years by Roles and Todd,[61] 38 per cent terminated fatally. Of 49 cases treated medically approximately one-half were dead, 9 totally incapacitated and of the remainder only 4 were "dry" 5 years after diagnosis. The natural course of the disease was studied by Perry and King[58] in 400 patients over a 12 year period, 1926 to 1938. Of these 260 were treated non-surgically and 140 surgically. By January, 1939, only 55 per cent of the non-surgical group were known to be living, 19 per cent were untraced, and 26 per cent were known to be dead. Forty-one per cent of the fatal cases died within 5 years after onset and this was directly attributable to the disease in 78 per cent. Of even greater significance is the fact that of 96 patients in whom the disease

developed before the tenth year only 35 per cent lived more than 20 years after the onset and 9.4 per cent thirty years or more, strongly supporting their clinical impression that the patient in whom bronchiectasis develops before the age of 10 does not live beyond the age of forty. Of the 144 living and traced patients 123 continued to raise sputum and 33 had hemoptysis of varying degrees. Only 38 per cent of these were considered to have good working and living capacity. In a follow-up on 171 patients with untreated bronchiectasis admitted to the Jefferson Medical College Hospital between 1925 and 1935, Bradshaw, Putney and Clerf[8] found that bronchiectasis or its complications resulted in a total mortality of 34.5 per cent and that in these fatal cases the average duration of life from onset of symptoms was 13.5 years. In a similar study of 85 patients with untreated and medically treated bronchiectasis Riggins[60] found that 14.1 per cent died, 41.1 per cent were definitely worse, 46.6 per cent essentially unchanged, and only 13.3 per cent could be considered as improved. Whereas these figures indicate clearly the high mortality attending untreated and medically treated bronchiectasis, the progressive physical and psychological debility constituting the morbidity factor is not sufficiently realized. Considerable impairment in the physical development of these patients begins in childhood and chronic invalidism continues throughout life. Of equal or perhaps greater significance is the psychological handicap which has been emphasized particularly by Churchill.[13] The social ostracism resulting from their unpleasant symptoms is soon manifest and eventually they develop psychological changes varying in degree from mild depressions to actual psychopathic personalities. Thus, it becomes apparent that untreated and medically treated bronchiectasis is attended with a high mortality, a relatively short life expectancy and a devastating morbidity, and that these undesirable consequences of the diseased lung can be eliminated effectively and permanently only by surgical extirpation.

The main objection to surgical therapy has been the prohibitively high mortality attending the early attempts at operation. As previously emphasized, this has unfortunately persisted as a stigma of surgical therapy. Actually the representative mortality of approximately 60 per cent in lobectomy for chronic pulmonary suppuration prior to the last decade should be considered in the light of pioneering spirit.[38] Since the introduction of the single stage lobectomy by Brunn[10] about a decade ago the mortality has steadily decreased and more recent refinements in preoperative preparation, anesthesia and operative technique have reduced it to less than 3 per cent. Over a ten year period, Edwards[18] performed lobectomy in 168 cases with a total mortality of 12 per cent and in

the last 54 cases, the mortality was only 3.7 per cent. Even more significant is the fact that he had no deaths in the 38 patients between the ages of four and sixteen years. Churchill[14] recently reported a series of 124 cases in which lobectomy was performed with a mortality of only 2.4 per cent. These and other recent reports[1,16,22,23,31,35,39,45] demonstrate clearly that surgical therapy, the only curative measure, may now be considered a relatively safe procedure.

As previously emphasized[54] the indications for operation are frequently difficult to delineate and depend upon the age, general condition of the patient, extent of involvement, and character and degree of manifestations. Careful appraisal of these various factors is important and requires a thorough study of each case. Thus, the removal of the lower lobe only in a patient with involvement of the right middle lobe and lingula of the left upper lobe will not cure the patient. It becomes apparent, therefore, that the extent and distribution of the disease must be carefully determined by bronchographic "mapping" of the entire lung.[2,30,57,67] This is best accomplished by lipiodolization[64] of the individual lobes under fluoroscopic visualization followed by posterior-anterior, lateral, and oblique roentgenographic projections. By such a study the extent and distribution of the disease process in each lobe may be accurately determined permitting a precise assessment of the extent of operation necessary to produce a cure. Whereas bilateral involvement is not in itself a contraindication to operation it is obvious that such a process is a greater surgical risk than unilateral involvement limited to one lobe or to the right lower and middle lobes and to the left lower and lingula. That unilateral involvement of the entire lung and bilateral involvement of the lower lobes[62] are not contraindications to operation is demonstrated by the fact that such cases have been subjected to successful surgical extirpation. Graham[24] has reported a successful result in a patient requiring removal of the right lower and middle lobes and the left lower and lingula divisions of the upper lobe. The significance of age in determining operability is shown by the fact that the operative mortality is lowest in children and increases proportionately with age. Thus, Edwards[18] observed a mortality rate of zero in 38 patients between the ages of 4 and 16 years, 9.5 per cent in 21 patients between 16 and 20 years, 14 per cent in 56 patients between 20 and 30, 15 per cent in the fourth decade and 31 per cent in the fifth decade. It is the consensus of most observers that operation is rarely indicated beyond the age of 45 which may be explained to a great extent by the fact that most patients do not survive this long unless the process is relatively mild and therefore do not require extensive surgical therapy, whereas those that do have such an extensive distribution that operative cure is precluded. Other factors

such as anemia and infection or their consequences do not necessarily constitute contraindications for they may be corrected by appropriate preoperative measures. Obviously, serious cardiovascular or renal disturbances or other severe complications are considered contraindications just as in any other major operation.

The preoperative preparation of the patient is extremely important and has contributed greatly toward the steady reduction of mortality. Since lobectomy is an elective procedure the necessary time and effort in getting the patient in the best possible physical condition for the operation are thoroughly justified. Every attempt should be made to eliminate sinus and focal infections and clear the bronchi of retained and infected secretions. The latter is accomplished preferably by postural drainage and repeated bronchoscopic aspirations. Immediately before and after the operation bronchoscopic aspiration is also performed *routinely*. Infection may also be combatted by the use of sulfonamides and neoarsphenamine. In the general rehabilitation of the patient a nutritious diet with vitamin supplements including particularly vitamins B and C is especially important. Appropriate therapeutic measures and even transfusions of whole blood are used to correct an associated anemia.

The significance of anesthesia in increasing the magnitude and safety of intrathoracic surgery is thoroughly realized by thoracic surgeons. The rapid advances and refinements in anesthesia have played an important role in the steady reduction of operative mortality in bronchiectasis. Detailed considerations of this subject have been presented in recent reviews.[5,19,26,40,42] In a previous publication[53] attention was directed to the important desiderata which are complete control of intrapulmonic pressure, adequate facilities for aspiration of secretions in the respiratory passages during the operation, the maintenance of quiet respirations and high oxygenation, the avoidance of distressing cough reflex, and the rapid return to consciousness following completion of the operation. Whereas the type of anesthesia and the choice of anesthetic agent appear to be matters of personal preference, all are agreed that the availability of a skillful and highly trained anesthetist is essential.

Although variations in the details of operative technique exist depending upon the personal preference and experience of the surgeon and upon the pathological process found at operation, the salient features are now fairly well standardized. The choice of several types of incisions depends upon the presence or absence of adhesions, the distribution and extent of the process, and the performance of pneumonectomy or lobectomy. As previously emphasized[54] the incision should be performed on the basis of permitting adequate exposure, ready adaptability to encountered variations in the pathologic condition, minimal degree of trauma, and ease of

closure. In the authors' experience the most desirable incision for lower lobectomy consists of a postero-lateral approach with the incision beginning paravertebrally and extending forward along the seventh interspace to the anterior axillary line. The pleural cavity is entered through the seventh interspace and the paravertebral portions of the seventh and eighth ribs are divided permitting wider separation (Fig. 1). Occasionally it is more convenient to use an interspace higher or lower depending upon individual variations.

After entering the pleural cavity adhesions are divided by sharp dissection and, for lower lobectomy, the inferior pulmonary ligament severed as high as the inferior pulmonary vein, and the lobe mobilized down to the hilum by separation at the interlobar fissure. Several methods of excision of the diseased lung may be employed,

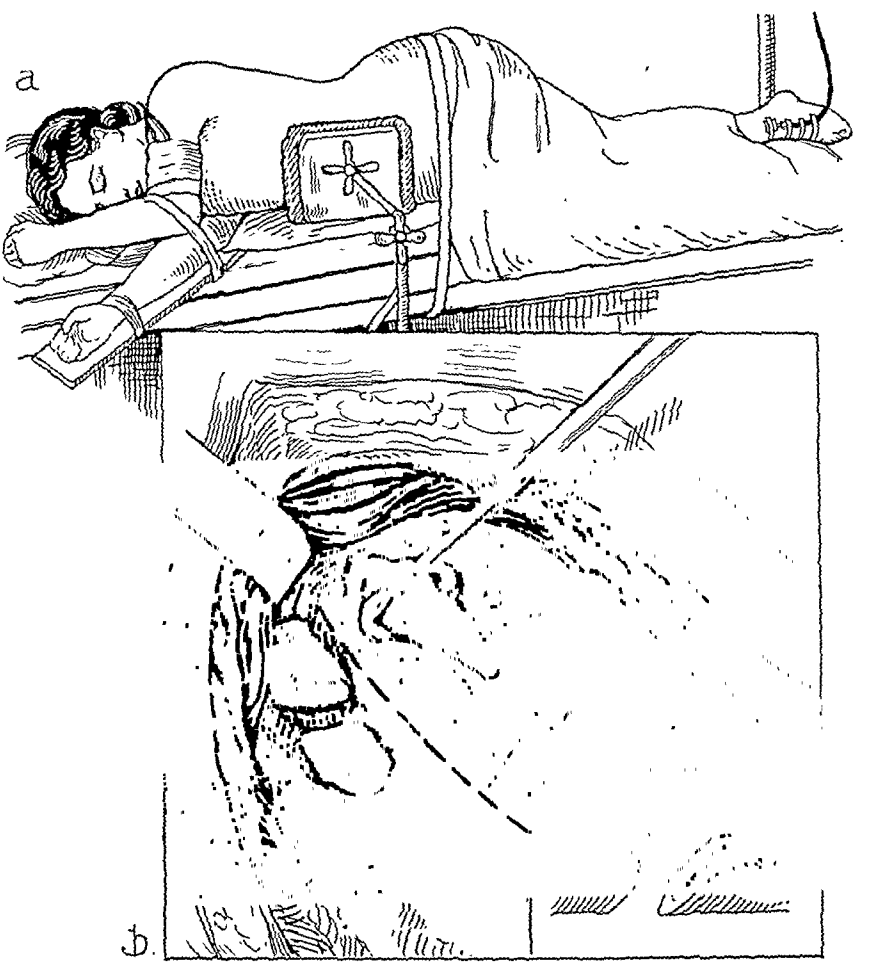

Fig. 1—Technique of lobectomy for bronchiectasis. (a) Position of patient for operation on left side. A cannula is placed in the saphenous vein immediately anterior to the medial malleolus for the purpose of administering whole blood, plasma, or other fluids during the operation. (b) The pleural cavity is entered through an interspace and greater exposure permitted by separating the rib above and below after their subperiosteal division paravertebrally. (c) The ribs are divided at a slight angle to permit better fixation when the wound closed.

namely, mass ligation, individual isolation and ligation of the intrahilar structures, and segmental pneumonectomy. The last procedure may be employed in removal of the lingula and in excision of the lower lobe with preservation of its large dorsal segment in cases in which this part of the lower lobe is uninvolved.[15] Pneumonectomy is occasionally necessary and may be performed by mass ligation with a tourniquet or individual isolation and ligation.

The advantage of the tourniquet technique of lobectomy lies in the fact that it obviates tedious dissection and thus permits a more rapid performance of the operation which may be especially desirable in poor risk patients and it possibly decreases the danger of accidental serious hemorrhage. Its obvious disadvantages are due to the inherent results of mass ligation and the consequences of devitalized infected tissue. The technique of tourniquet lobectomy[12,63] is relatively simple and consists essentially in mobilizing the lobe down to the hilum, where the tourniquet is applied and tightened, and severing the hilar structures just distal to the tourniquet. A series of deep interrupted sutures are placed in the hilar stump until the bronchial and vascular structures are securely ligated following which the tourniquet may be released and removed. A localized empyema invariably occurs and a bronchial fistula is not infrequent. For this reason intercostal catheter drainage is always instituted at the time of operation. The subsequent contraction by scar tissue results in healing of the fistula.

Whereas in some cases because of difficult accessibility of the hilar region due to unusual inflammatory adhesions, enlarged lymph nodes, and rudimentary fissures tourniquet lobectomy must be employed, intrahilar lobectomy is considered preferable and the growing tendency toward its wider adoption indicates its value. It has the obvious advantage of permitting the application of better surgical principles, complete removal of disease tissue and more accurate bronchial closure with resultant decrease in postoperative morbidity. As previously emphasized,[54] however, its technical performance necessitates a thorough concept of the anatomic patterns and variations of the segmental division of the pulmonary vessels and bronchi. This has been afforded by the recent surgical anatomical studies of Nelson,[44] Churchill and Belsey,[15] and Blades and Kent.[7] Based upon the demonstration of four major bronchovascular segments these investigators suggest that each lung may be considered as having four lobes: upper, middle, dorsal, and lower. The apical portion of the lower lobe constitutes the dorsal lobe and the lingula of the left upper lobe corresponds to the right middle lobe. According to Churchill and Belsey,[15] "Each lobe possesses an independent bronchus and blood supply and is separated from the adjacent lobes by either a complete or partial fissure, or

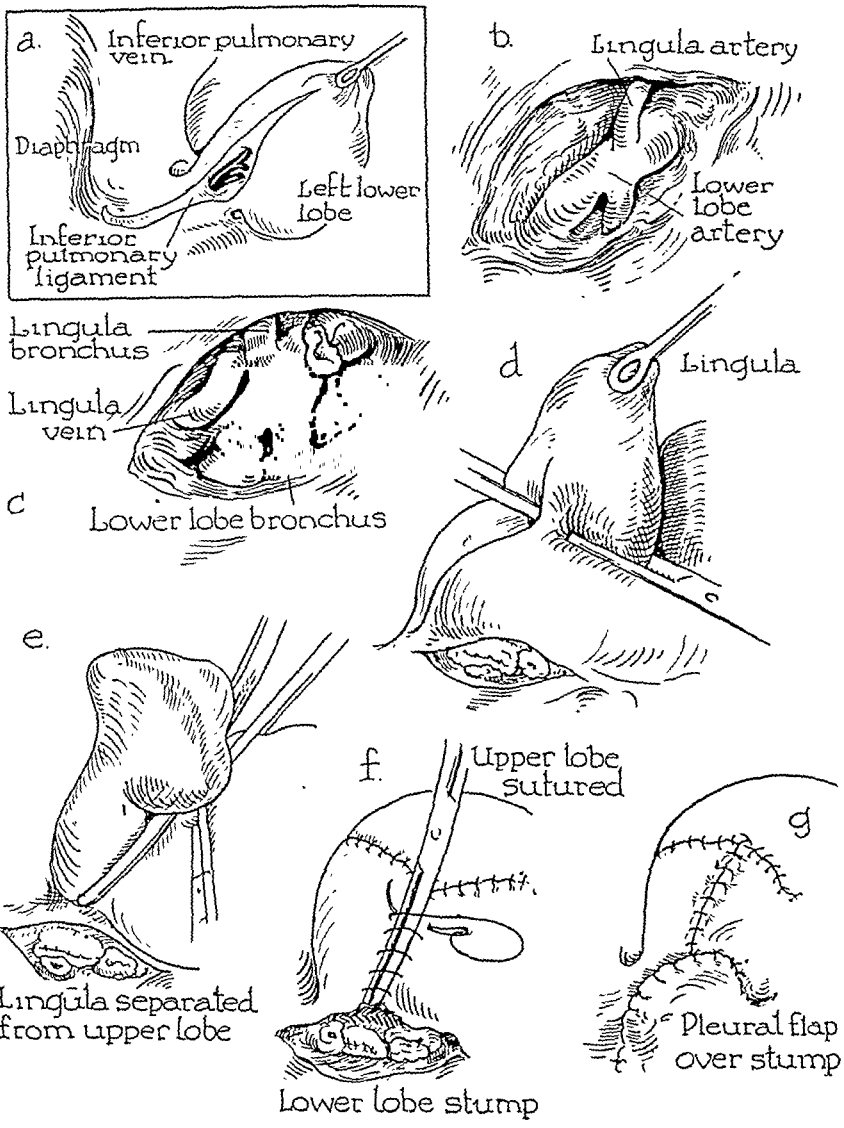

Fig. 2—Technique of intrahilar lobectomy on left side. (a) The inferior pulmonary ligament is severed as high as the inferior pulmonary vein which is divided between ligatures and the lower lobe mobilized down to the hilum by separation at the interlobar fissure permitting exposure of (b) the pulmonary artery to the lower lobe with its lingula branch. In cases in which the lingula is also involved and requires extirpation the technique of segmental pneumonectomy as described by Churchill and Belsey may be followed. (c) The inferior pulmonary artery including the lingula division is divided between double ligatures and transfixation sutures and the lower lobe bronchus with its lingula branch exposed. Both of these structures are divided between clamps and the proximal ends closed by the technique shown in Fig. 3g. (d) Clamps are applied across the lung substance between the atelectatic lingula and the remaining portion of the upper lobe in a T-shaped fashion as shown in (e) and the lingula removed by severance distal to these clamps. (f) The defects are closed by a running of atraumatic chromic 0 catgut. (g) The structures of the hilar stump are covered with a pleural flap.

by an avascular plane of cleavage across which no vascular communications are encountered until the hilum is approached." These authors have directed attention to the clinical and surgical significance of the lingula segment of the left upper lobe. They found that "the lingula is also involved sufficiently to demand resection in at least 80 per cent of the cases of bronchiectasis of the left lower lobe." It was also observed that in such cases "commonly the posteromedial bronchi of the lingula bronchus alone is diseased and only rarely are both branches involved." They found anatomically that the lingula bronchus arises from the inferior aspect of the left upper lobe bronchus about one to two cm. from its origin and extends downward and forward to terminate in anterolateral and posteromedial divisions. In cases in which the bronchiectatic process involves the left lower lobe and the lingula, the latter is resected following the intrahilar lobectomy by the technique of segmental pneumonectomy described by Churchill and Belsey.[15] This consists essentially of individual isolation and ligation of the hilar structures of the lingula and severance of lung substance between clamps applied along the cleavage plane between the lingula and the remaining upper lobe (Fig. 2). This is facilitated by delineating the lingula as the atelectatic segment following first deflation of the upper lobe, temporary occlusion of the lingula bronchus, and then reinflation of the upper lobe.

On the right side in addition to the lower lobe the middle lobe is not infrequently involved by the bronchiectatic process.[6,43] For this reason the bronchographic delineation of these structures prior to operation is essential. Obviously in such cases extirpation of both lower and middle lobes is necessary for a successful result. However, in cases in which only the lower lobe is involved and requires removal care must be exercised in the intrahilar division of the lower lobe bronchus in order to avoid the inadvertent occlusion of the middle lobe bronchus. The possibility of this accident has been demonstrated by the anatomical dissections of Blades and Kent.[7] These investigators found that in a "very appreciable number of instances . . . the point of origin of the dorsal lobe bronchus is either virtually opposite or even above the level of the middle lobe bronchus." Accordingly in cases in which only the lower lobe is to be removed and in order to avoid encroachment upon the orifice of the middle lobe bronchus the dissection must be carried down "along the bronchus until it is possible to divide the dorsal lobe bronchus and the main trunk to the lower lobe at a point distal to the bifurcation which yields the dorsal lobe bronchus"[7] (Fig. 3c). Advance knowledge of these anatomic variations may be obtained by careful preoperative bronchoscopic and bronchographic studies. It becomes evident from these considerations that successful technical per-

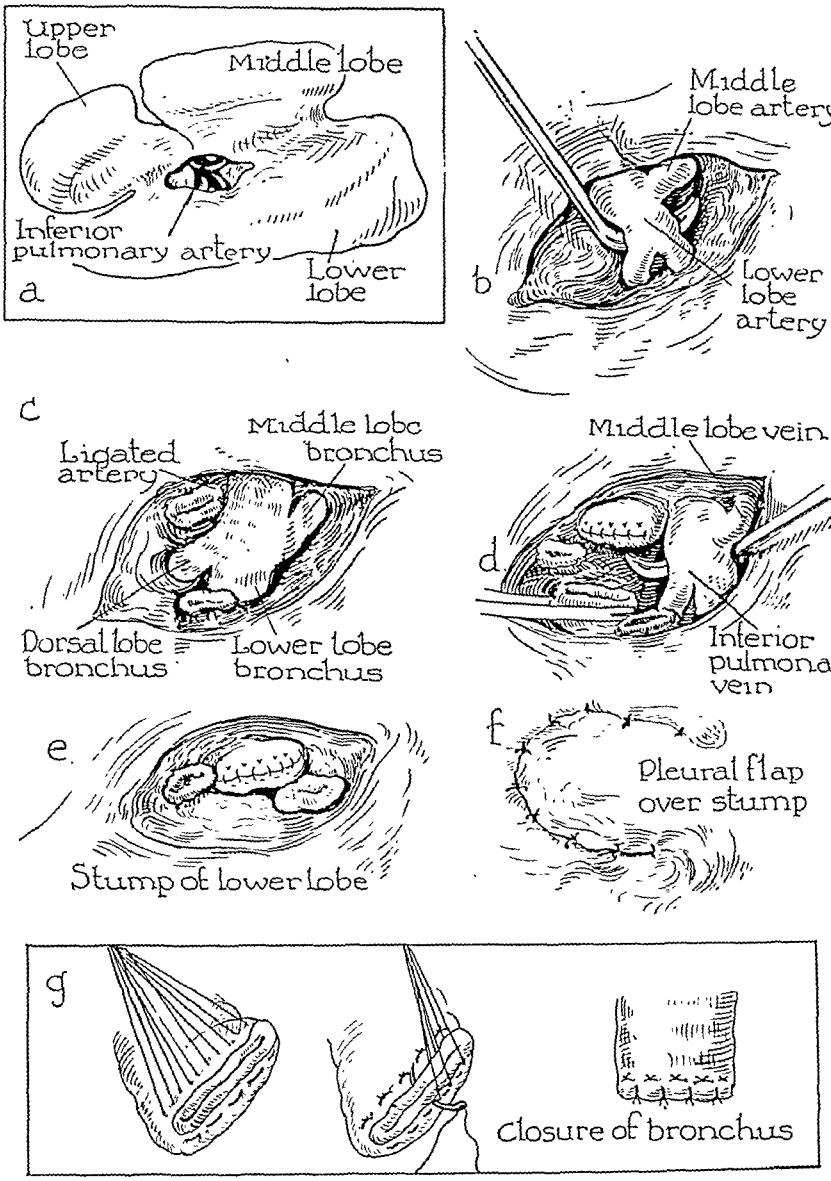

Fig.3—Technique of intrahilar lobectomy on the right side. (a) After mobilizing the lower and middle lobes by separation of the interlobar fissure the pleura over the hilum is opened and the inferior pulmonary artery with its middle lobe branch exposed. (b) The artery is then divided between double ligatures and transfixation sutures. (c) The lower lobe bronchus is then exposed, care being taken to recognize the middle lobe bronchus and the bronchus to the dorsal lobe division of the lower lobe. In some cases it may be necessary to divide the dorsal lobe and lower lobe bronchi individually to prevent encroachment on the opening of the middle lobe bronchus. The bronchus is divided between clamps and the proximal end closed as shown in (g). (d) The inferior pulmonary vein is then exposed and its branch from the middle lobe recognized. The vein is divided between double ligatures distal to the branch from the middle lobe. Obviously in cases in which the middle lobe is involved and must be removed the bronchus and vessels of the middle lobe are similarly ligated and divided. (e) The stump of the lower lobe or the lower and middle lobes is covered with a flap of pleura as shown in (f). (g) The technique of closing the bronchial stump consists of placing proximal to the clamp a first row of mattress sutures which are tied after removal of the clamp and a second row of interrupted sutures placed just distal to the first row and tied over the ends of the bronchus.

formance of intrahilar lobectomy depends upon an accurate knowledge and a thorough concept of the anatomic relationship and the possible variations of the bronchovascular structures.

Following the isolation of the intrahilar structures the vessels are preferably ligated individually by double ligatures and transfixation sutures of cotton[55] (Fig. 3). The bronchial stump is closed with simple interrupted sutures over its end and proximal mattress sutures of cotton (Fig. 3g). The ends of these structures are covered with a small flap of visceral or mediastinal pleura (Fig. 3f). Drainage of the pleural cavity is provided by an intercostal catheter and the wound is closed (Fig. 4). The local application of a sulfonamide and its preoperative and postoperative administration to establish an effective concentration in the blood have been em-

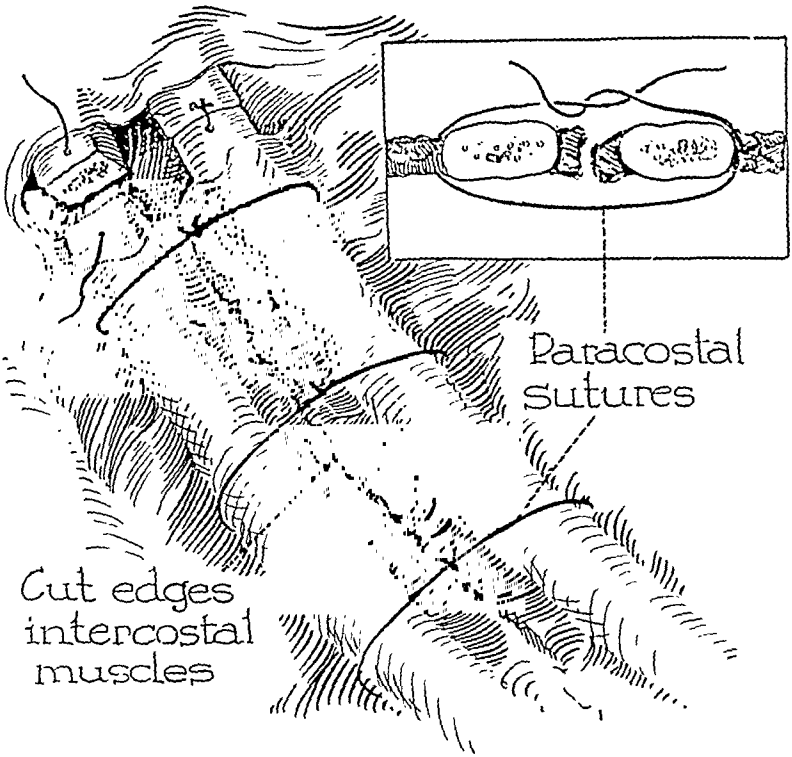

Fig. 4—Technique of wound closure. Fixation of ends of divided ribs during closure of wound. A small hole is drilled through the ends of each rib a short distance from the line of division and a fine stainless steel wire is threaded through the holes. The ends of the ribs are held together as the wire is tightened and tied. It should be observed that the ribs have been divided at a slight angle to permit better fixation. As the rib immediately above and below the incision are pulled and held together with hooks paracostal sutures are applied and tied as shown in the inset. Thus the edges of the parietal pleura and intercostal muscles are approximated and the incision into the pleural cavity closed by stabilization of the ribs rather than by attempting to suture the friable parietal pleura and intercostal muscles.

ployed as indicated by recent clinical and experimental studies.[3,11,32]

Pneumonectomy is only occasionally necessary in bronchiectasis as shown by the fact that in 133 pulmonary resections for bronchiectasis Churchill[14] performed pneumonectomy in only 9 (6.7 per cent). The procedure may be performed in one or more stages and by the tourniquet technique or intrahilar dissection. In the authors' experience the procedure of choice is individual isolation and ligation of the intrahilar structures in one stage. The technical details of this procedure have been described and illustrated in previous publications.[52,53]

Bronchoscopic aspiration immediately following the operation is routinely performed. The decreased postoperative morbidity resulting from the removal of viscid mucopurulent secretions by this means has convincingly demonstrated its value. Meticulous attention to postoperative care is important especially during the first few hours and days. Precautions taken to combat shock during the operation are continued postoperatively. Thus, routinely before operation a cannula is inserted preferably into the saphenous vein immediately anterior to the medial malleolus[33] through which a solution of 5 per cent glucose and physiologic saline may be administered slowly during the operation. Compatible whole blood or plasma is always available in the operating room for immediate transfusion in case of serious hemorrhage or evidence of impending shock and such measures are continued for the first few days postoperatively. Oxygen is administered routinely for the first twenty-four or forty-eight hours. Although immediately postoperatively it is considered preferable to keep the patient on his back or on the operative side, later changes in position are encouraged as well as coughing and deep breathing exercises. Vitamin supplements especially B_1 and C are given parenterally until the patient can resume oral feedings. Negative pressure is applied to the catheter which is inspected frequently to assure efficient function. It is allowed to remain from two to four days in cases with minimal contamination and longer in tourniquet lobectomy cases. In uncomplicated cases the patients are permitted to be out of bed within ten days.

SUMMARY

1) The rationale of surgical therapy in bronchiectasis is based upon a thorough comprehension of the pathogenesis, irreversible pathologic features, natural prognosis and morbidity, and the limitations of conservative therapy. These features of the disease are briefly considered.

2) During the last two decades the rapid advances and refinements in preoperative preparation, anesthesia, and operative tech-

nique have resulted in a steady reduction in mortality until it has now reached the amazingly low level of 3 per cent.

3) The indications for operation are briefly discussed and the significance of an accurate study of the distribution of the disease process in each lobe in permitting a precise assessment of the extent of operation necessary to produce a cure is emphasized.

4) Appropriate measures in the preoperative preparation and postoperative management of the patient are indicated and their importance stressed.

5) The various methods that may be employed in the surgical extirpation of the diseased lung, namely, mass ligation, individual isolation and ligation of the intrahilar structures, and segmental pneumonectomy are briefly described and their advantages, disadvantages, and indications are discussed. Wherever feasible intrahilar lobectomy is considered the most preferable procedure.

RESUMEN

TRATAMIENTO QUIRURGICO DE LAS BRONQUIECTASIAS

La terapeútica quirúrgica racional en las bronquiectasias está basada en la total comprensión de la patogenia, de los caracteres patológicos irreversibles, del pronóstico natural, de la morbilidad y de las limitaciones del tratamiento conservador. Estas características de la enfermedad son brevemente consideradas.

Durante las últimas dos décadas el rápido avance y perfeccionamiento del pre-operatorio, anestesia y técnica quirúrgica ha dado como resultado una considerable reducción en la mortalidad que ha descendido a la admirable cifra de 3%.

Las indicaciones operatorias son brevemente discutidas y se destaca la importancia de un prolijo estudio de la distribución del proceso en cada lóbulo, lo que permitirá establecer la indicación quirúrgica precisa para producir la cura.

Se indican las medidas necesarias en la preparación pre-operatoria y en el postoperatorio del paciente y se destaca su importancia.

Son brevemente descriptos los diversos métodos que pueden ser empleados en la extirpación quirúrgica del pulmón enfermo, especialmente la ligadura en masa, el aislamiento individual y la ligadura de los elementos intrahiliares, y la meumectomia segmentaria, discutiendosé sus ventajas, inconvenientes e indicaciones. Siempre que sea factible la lobectomia intrahilar es considerada el procedimiento de elección.

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EDITORIAL.

INTRODUCING OUR NEW FORMAT

Here is our new journal. We hope that you like it. The many innovations which you have no doubt noticed have been the result of considerable research and correspondence with our readers. The success of any publication can be achieved only by the adoption of a policy which appeals to its readers. This we have endeavored to do with *Diseases of the Chest.*

This issue of the journal sets the tempo of what is to be expected in the future issues. The Editorial Board is deeply grateful to Dr. Paul H. Holinger who arranged for the compilation of the Symposium on Bronchiectasis published in this issue of the journal. In order to maintain the high standards which we have set as our goal, we urge that the Fellows and Associate Fellows of the College send us their material, and if it is meritorious, it will find a ready place in *Diseases of the Chest.*

We suggest that you read the President's New Year Message on the succeeding pages of this issue of your journal. Dr. Peabody has pointed a way to College members for service during these trying days.

The Council on Pan-American Affairs of the College is performing an admirable task. You will find a resumé of their activities published in the College News columns of the journal. Read the reports of the Council on Undergraduate Medical Education and the National Council of Tuberculosis Committees published in this issue of your journal. The College program is forging ahead despite the many obstacles and the inconveniences incurred because of war conditions.

This is your journal. We want you to be proud of it. We also want it to serve a useful purpose. We are publishing this enlarged journal with full confidence in the ultimate success of our war efforts and in the loyal support of the Fellows and Associate Fellows of the American College of Chest Physicians.

R. C. M.

J. Winthrop Peabody, M.D.
President
American College of Chest Physicians

President's New Year Message

The year whose advent we acclaim at this season may well prove to be the most fateful and critical in our history as a nation. The titanic struggle in which we have perforce become a reluctant participant bids fair to continue far into the dim and distant future. How and when it will end is quite beyond the power of mortal man to predict. Yet this reflection alone should spur us all to renewed endeavors to do our share both as an organization and as individual members of the latter to aid our beloved country in the eventual attainment of a glorious victory and the complete realization of the aspirations and ideals which it is striving so unselfishly to defend and vindicate.

A long roster of our members who have already entered the armed forces at home and abroad affords impressive evidence of the sterling qualities of mind and heart which inspired their voluntary enlistment in a righteous crusade. Their number at present comprises more than a sixth of the total membership of the College. To these loyal comrades we offer our heartiest greetings and sincerest good wishes for the new year. Of one fact we may all rest assured, and that is, no matter how great the sacrifice which is required of them, our colleagues in the military and naval medical services will not fail to respond to the call of duty. Those of us who on account of age or because of physical infirmity are unable to accept or ineligible to receive commissions with the armed forces will find many opportunities for their ministrations to patients in civil communities. Among the latter particularly, the hazard of infection with tuberculosis has been markedly augmented by conditions imposed as a result of the war.

Meanwhile, despite the perils and amid the alarums of the conflict, the College proposes during the forthcoming year to prosecute with unabated energy its efforts to achieve the aims and objects stated in its articles of incorporation. Since these major objectives have for the most part been discussed in detail in the inaugural address of your President, and are moreover familiar to most of our members, their further consideration need not detain us here.

One notable exception to the foregoing generalization relates to our official organ, *Diseases of the Chest*. With its first issue of the current year the journal appears in a new format modeled closely upon that previously adopted by the majority of medical periodicals intended for the perusal of specialists. It will be observed that a fine grade of heavily coated paper stock has been selected for the body of the journal. Henceforth all pages on which articles, editorials, notes, reviews, and similar matter are printed will contain a single column of text instead of two columns as heretofore. An attractive new cover has been especially designed to replace the old one. The editorial board plans also to increase materially the number of pages of each issue, and to include more illustrations with the text. Summaries of all principal articles are to be prepared and translated into Spanish, and these are to be appended to the respective contributions. A cordial invitation is addressed to members to submit articles dealing with diseases of the chest to the editorial board for publication in the new journal. Notwithstanding these additions and

innovations, which necessarily entail a considerably increased expenditure of funds for labor and material, there will be no advance in the annual dues to the members of the College. The journal will continue to depend largely upon revenue derived from advertising of ethical firms and their products. Accordingly, our members are earnestly urged not only to patronize these concerns themselves, but also to seek to induce others to do so.

Readers of the journal are reminded by the editorial board of the appearance early in the new year of the Directory of the College, which will contain the membership list, the articles of incorporation, the revised constitution and by-laws, the names and titles of officers, the personnel of councils and committees, and other valuable information of general interest. The reports of the activities of these councils and committees will be published regularly in the journal, and a complete account of the proceedings of these important units of the organization will be presented at each annual meeting of the College.

The cultivation of amicable relations with our fellow specialists in foreign countries has ever been a matter of particular concern to officials of the College. Thus far their efforts in this connection have been exerted on behalf of our friends and neighbors in Central and South America, as well as in Canada and Mexico. Many of these countries have already organized chapters of the College. The latest addition to the roll of these is the chapter recently established in Brazil. The College hopes to be able to organize a chapter in each of the countries referred to, under the auspices of its Council on Pan-American Affairs. Following the cessation of hostilities a similar campaign will be instituted in order to increase the membership of our College in foreign countries now involved in the war. We believe that the international amity which has always been fostered and preserved by scholars and scientists will (perhaps more than ever before) serve as a potent instrument of conciliation and as a basis for the permanent peace which is expected to follow the war.

As we are all aware, the title of the first month of the year in our modern calendar is derived from that bestowed upon the two-faced Roman god Janus, who in his role of doorkeeper of heaven was endowed with vision into the past as well as the future. Like this fabled deity of antiquity, we may with equal clairvoyance contemplate with pride and satisfaction the record of our accomplishments during the brief period of our corporate existence, and confront the future with courage and confidence in the ultimate success of our labors to promote the cause of our country and our College.

To each and every member of the College, its President extends his best wishes for a happy and prosperous new year.

Semi-Annual Report

The Council on Undergraduate Medical Education

American College of Chest Physicians

Obviously, it has been necessary to carry on the work of this Council through correspondence, except what has been accomplished by those of us who were able to get together at our annual meetings.

A short time after our meeting in Atlantic City this year, the medical schools throughout the United States were divided into groups. Each group of schools was assigned to the member of the Council residing nearest the location of these particular schools, and the members of the Council were asked to take the lead in interesting the schools in their district in the work of this Council.

A little later a reprint of my talk given at the annual meeting in October, 1941, of the Association of American Schools on "The Teaching of Tuberculosis in Medical Schools," together with the schedule submitted by this Council for the teaching of the chronic diseases of the lungs in medical schools, was mailed to all the medical deans.

A large proportion of deans made personal replies. Some of them wrote comments of some length. As Chairman, I wrote a personal letter to all the deans whose replies were other than formal. I also wrote a letter in answer to all the formal replies. In addition, I drafted a letter to all those deans who did not reply, calling their attention to this reprint. In this letter to the deans, I called their attention to the fact that they were at that time being sent a reprint of the transactions of this Council as they took place in our Cleveland meeting in 1941, together with a resumé, of why the American College of Chest Physicians was exerting so much effort in the endeavor to improve the method by which tuberculosis is taught in medical schools. This resumé was as follows:

RESUME

The Council of American College of Chest Physicians on Undergraduate Education in medical schools is making an effort to assist in bringing about a more systematic and uniform method of teaching tuberculosis in our medical schools for the following reasons:

1) Because tuberculosis, at the present time, is the greatest medical and public health problem with which any state has to contend.
2) Because we are now faced with a national as well as a world-wide increase of tuberculosis, as history reveals that war has always brought about a definite increase in this disease.

3) Because it is realized that each medical school is anxious to discharge its responsibilities to the public by offering to medical students a training in the fundamentals of any particular branch of medicine which is in direct accord with the importance of that particular subject to the public.

4) Because tuberculosis is recognized as a preventable disease as well as the most curable of chronic diseases.

5) Because, notwithstanding the fact that it is a preventable and curable disease, there are approximately 70,000 deaths from tuberculosis as well as the development of 110,000 new cases each year in this country. In addition, tuberculosis is still the leading cause of death in that age group from 15 to 45 years.

6) Because the knowledge and understanding of the diagnosis, treatment and prevention of tuberculosis, as accepted today, has been developed only during very recent years.

7) Because the control of tuberculosis is one of direction—direction through education of the public as a whole; the public can be educated only by first educating those who in turn must do this educating, that is, the practicing physician.

8) Because the final solution of the problem of tuberculosis can be accomplished only by the training of physicians in the fundamentals which have to do with the technic and importance of early diagnosis, the technic and importance of early intensive treatment and the technic and importance of the prevention of tuberculosis while they are in school.

It is not the idea of this Council that the medical student should be made a specialist in tuberculosis, but simply that he should and must have a practical understanding of the essential procedures in the diagnosis, treatment and prevention of tuberculosis.

9) Because an understanding of tuberculosis cannot be taught to medical students by presenting the subject to them in the disconnected manner in which it is encountered in other fields of medicine, but rather if the student is to obtain a practical, workable understanding of this subject, it must be presented in a chronological order and the facts pertaining to the disease correlated by teachers who themselves have a thorough workable understanding of the subject as a whole. As has been aptly said, "Unless one's knowledge is well organized, the more he has of it, the greater is his confusion."

10) Because the essential procedures in the handling of tuberculosis cannot be taught in a few weeks or in a few months. They can be taught only by affording the student an opportunity to see and study the disease as it occurs, that is, over a period of many months or years.

With few exceptions, medical schools are not expected to devote more time to the teaching of tuberculosis than is now allotted. It is suggested, however, that they arrange that time so as to give the student the long range aspect of this disease which will enable him to understand and appreciate the varied and unpredictable changes that are characteristic of its always protracted course.

11) Because through our own experience in tuberculosis work in general and by our own contact with younger doctors who come from the various medical schools throughout the land, it is our conviction that few medical graduates are now equipped to play the part they should and must play if tuberculosis is to be brought under control.
12) Finally, because if students, while they are in school, do not obtain a workable understanding of the procedures essential in the control of tuberculosis, very few will obtain this understanding after graduation, due to lack of interest and lack of opportunity.

At the same time the statement was made to the deans in this letter that the members of this Council, the Governors of the College, the Presidents of the Chapters and all official representatives of our organization were being asked to cooperate with each other in contacting the medical schools in their locality and to use their utmost effort to interest the schools in our teaching schedule.

The fact was stressed that particularly personal contact with those in charge of teaching, especially contact by those personally known to them, would be most effective in interesting medical faculties in this work.

A letter was sent to the Governors, Presidents of the Chapters and other official college representatives acquainting them with what was being done. They were also sent a copy of the resumé and copies of all the correspondence with the deans or official representatives of the medical schools.

A rather large proportion of the deans have shown interest enough to reply to the receipt of the second reprint and the copy of the resumé. A number of the schools manifested particular interest and expressed not only a willingness but a desire to meet with our representatives to discuss our problem. The following letters copied verbatim, with marks of identification being omitted, represent in general the spirit of the replies received and the kindly interest that most medical deans have in this work:

November 18, 1942

Dr. E. W. Hayes, Chairman
Council on Undergraduate Medical Education
American College of Chest Physicians
Monrovia, California

My Dear Doctor Hayes:

Your letter of November 10th has been received and I wish to thank you for your excellent reprint entitled, "Meeting of the Council on Undergraduate Medical Education." The mimeographed copy of your resumé has likewise been received.

Either Dr....., Director of the Department of Medicine, or I shall be glad to see the representative of your College, who may

visit..... Kindly have him notify us in advance in order that we will not have conflicting engagements.

With kindest personal regards.

Very sincerely yours,

.....M.D., Dean.

November 12, 1942

Dear Dr. Hays:

I appreciate your interest in the teaching of tuberculosis in medical schools and assure you that we realize its value. In order to organize our instruction, we have been giving all-day symposia on the subject to the third-year students for the last two or three years and have found this method of presentation very beneficial. Also, our students have obtained very valuable experience with tuberculosis in connection with their clerkship in Preventive Medicine in their fourth year at the ..... Health Center.

I am forwarding your letter and outline to Dr....., the member of our department of Medicine who is especially interested in these problems, and I am sure that he will be glad to discuss the matter with your representative.

Very sincerely yours,

..... M.D.

President and Dean

November 12, 1942

Dr. E. W. Hayes
American College of Chest Physicians
500 North Dearborn Street
Chicago, Illinois

Dear Doctor Hayes:

Thank you for the information regarding your tuberculosis program. We are very much interested in that subject here and I am referring your correspondence to a special committee which was appointed to deal particularly with the problem of tuberculosis in our own student body and staff in addition to the members of our Department of Internal Medicine, all of whom are, of course, vitally interested in this subject. Dr....., head of the Department of Pediatrics, has for many years been very active in the field of tuberculosis in childhood. I feel sure that he, as well as Dr. ..... , head of the Department of Internal Medicine, will be especially interested in the development of your program for teaching tuberculosis in medical schools.

Very sincerely yours,

....., M.D.

Dean

I want to stress to the official representatives of the College in the various areas the very great importance of their taking advantage of the interest in this program shown on the part of medical schools. Again, I want to urge all the official representatives to contact their respective schools as soon as possible, even though no special interest has been manifested by those in charge of the

school. All schools have our literature at hand and have had a chance to study it, and personal contact by you men who are more or less in touch with the schools may accomplish a great deal in setting up the interest required.

The following reply illustrates the method by which tuberculosis is now taught in a number of schools. While this method is perhaps better than the method or methods of teaching in use in many schools, it does not present to the student that necessary long range conception of tuberculosis:

November 14, 1942

Dr. Edward W. Hayes,
Monrovia,
California.

Dear Dr. Hayes:

I appreciate very much your kind offer of assistance in arranging the teaching of tuberculosis in our medical school.

Dr....., Associate Professor of Medicine and head of the County Tuberculosis Sanatorium, has charge of the teaching of tuberculosis. Each year all of the students spend a while in the Tuberculosis Sanatorium and thus acquire a first hand knowledge of the disease, which is impossible in a general hospital. I realize that perhaps enough time is not devoted to the teaching of tuberculosis. This is true of teaching in all other departments. I feel, however, that at present we are doing as well as we could do. The medical college curriculum is becoming so crowded that it is rather difficult to keep it in hand.

Thanking you for your letter and with kind regards,

Yours very sincerely,

....., M.D.

In the teaching schedule which was devised by this Council and on many other occasions, we have repeatedly stressed the point that, with very few exceptions, an adequate system of teaching chronic diseases of the lungs does not require that more time be devoted to the teaching of this subject than is now devoted to it in medical schools. We have emphasized the fact that in order to teach tuberculosis as it must be taught the arrangement of the time is the important factor. Many times we have called attention to the fact that tuberculosis is primarily a chronic disease; that in being chronic, it is not a disease of a few days or a few weeks but rather a disease of months and years and that during its prolonged course it is characterized by many varied and unpredictable changes in its course. We have stressed the point, that in order for the subject to be presented to medical students in a manner that will give them an understanding and a practical knowledge of the fundamentals which have to do with the diagnosis, treatment and prevention of the disease, the disease must be presented to them

as it occurs, that is, over a period of months and years.

In our teaching schedule we have made provision for the selection of a group of patients, large or small, according to the opportunity for such selection, representing as far as possible the various stages and types of tuberculosis. This group of patients is to be used as teaching material by being presented to the students periodically during their third and fourth years in medical school. If it is necessary to save time, it would be satisfactory for the students to have an opportunity to observe these patients and the course of their disease briefly at monthly or even bi-monthly periods. The student will then, and only then, be afforded an opportunity to obtain an understanding of tuberculosis.

The replies received from some medical schools stated that, because of war conditions, they did not feel that for the present they would be able to do very much about improving their method of teaching chronic diseases of the lungs. This Council realizes that at this time medical schools are handicapped by a shortage of manpower and in other ways. It is hoped, however, that those schools which have not already done so, will at least start to plan a teaching program that will be in keeping with the present-day concept of the diagnosis, treatment and prevention of tuberculosis. Such a move is made all the more imperative by the increase in tuberculosis in this country that is bound to come because of the war.

The arrangement of such a program will require time and effort as well as an understanding of the long-range scope of the disease, tuberculosis. If this program is planned now, when the war is over and medical faculties are again complete, it can be readily put into effective operation. If such a program had been set up in medical schools twenty or twenty-five years ago, literally millions of lives would have been saved and tuberculosis today would not be a serious problem. Until such a program is set up many more people will go on dying in this country each year of this, a preventable disease, than died during the past year as the result of the war.

This work has been made possible through the cooperation of our Chicago office. That office has mailed out the reprints and has also copied and mailed out all the letters and other material.

The members of this Council are as follows:

Dr. E. W. Hayes, Chairman, Monrovia, California
Dr. H. Frank Carman, Dallas, Texas
Dr. Jerome R. Head, Chicago, Illinois
Dr. Thos. J. Kinsella, Minneapolis, Minnesota
Dr. C. Howard Marcy, Pittsburgh, Pennsylvania
Dr. George G. Ornstein, New York, New York
Dr. H. I. Spector, St. Louis, Missouri
Dr. Moses J. Stone, Boston, Massachusetts
Dr. Nelson W. Strohm, Buffalo, New York

Report*

National Council of Tuberculosis Committees

American College of Chest Physicians

It is a well-known fact that the general practitioner should be included in the tuberculosis control program. One of the main functions of the American College of Chest Physicians is to bring the latest scientific knowledge in the treatment and control of tuberculosis to the general practitioner. The ideal arrangement would be a tuberculosis committee in every county and state medical society. These men will take an increasing interest in supervision of the tuberculosis testing and x-raying in the schools. They will also cooperate and advise with the county and state tuberculosis associations.

It has been through the efforts of previous College tuberculosis committees that the state medical societies have been stimulated to appoint state tuberculosis committees. This work has developed satisfactorily in a few years' time so that at present there are 34 state medical societies that have a state tuberculosis committee. There are also 11 states that have county medical tuberculosis committees. In a number of states that do not have tuberculosis committees, there is a tuberculosis department of the state board of health which does much to stimulate tuberculosis work throughout those states.

Minnesota has an interesting plan of accrediting counties which show an average death rate of less than 10 per 100,000 for five years and whose seniors in high schools show 15 per cent or less positive reaction to the Mantoux test. This plan should be watched and if successful in stimulating interest, might well be adopted in other states.

In Indiana, the members of the state tuberculosis committee are all members of the College. They have a joint meeting of the tuberculosis committee and the College Chapter at the time of the state medical meeting. Members of the county tuberculosis committees are invited to this meeting and an interesting chest program is presented. They also hold a mid-winter meeting of the state tuberculosis committee and the College Chapter. One issue of the state medical journal is devoted to chest diseases.

Indiana has recently enacted a law requiring x-ray examinations

*Presented at the Eighth Annual Meeting of the American College of Chest Physicians, June 7, 1942, Atlantic City, New Jersey.

of all school employees. The state tuberculosis committee worked with the state tuberculosis association in sponsoring this law. They also act in an advisory capacity with school authorities, county medical associations, the state board of health, and the state tuberculosis association in ironing out problems which have arisen from this law.

It is realized that the establishment and proper functioning of tuberculosis committees is uphill work but your committee feels that definite progress has been made and the work should be continued.

State Tuberculosis Committees

Arizona
Arkansas
California
Colorado
Delaware
Florida
Georgia
Idaho
Illinois
*Indiana
*Iowa
*Kansas
Louisiana
Maine
*Michigan
Minnesota
*Missouri
*Montana
Nebraska
New Hampshire
*New Jersey
New Mexico
New York
*North Carolina
Ohio
Oregon
*Pennsylvania
*Rhode Island
*Tennessee
Texas
Virginia
Washington
Wisconsin
District of Columbia

No State Tuberculosis Committees Reported

Alabama
Connecticut
Kentucky
Maryland
Massachusetts
Mississippi
North Dakota
Oklahoma
South Carolina
South Dakota
Utah
Vermont
West Virginia
Wyoming

*County Tuberculosis Committees reported.

Dr. James H. Stygall, Chairman, Indianapolis, Indiana
Dr. Carl Aven, Atlanta, Georgia
Dr. David W. Heusinkveld, Cincinnati, Ohio
Dr. Alfred R. Masten, Denver, Colorado
Dr. John W. Stacey, Tucson, Arizona
Dr. Nelson W. Strohm, Buffalo, New York
Dr. Francis J. Welch, Portland, Maine

COLLEGE NEWS

BOARD OF EXAMINERS

The Board of Examiners of the American College of Chest Physicians has prepared a written examination for candidates for Fellowship in the College, to be held in various cities throughout the United States on January 29. The examinations will be held under the auspices of the Board of Regents of the College.

Dr. George G. Ornstein, *Chairman*
Dr. Ralph C. Matson
Dr. Jay Arthur Myers

BOARD OF REGENTS

The mid-winter meeting of the Board of Regents of the College will be held at the Palmer House, Chicago, Illinois, on Sunday, February 14. This meeting has been arranged so that it will tie in with the Annual Congress on Medical Education and Licensure of the American Medical Association to be held at Chicago, February 15-16.

SOUTHERN CHAPTER TO BE ORGANIZED

A luncheon meeting for the members of the College in the states that affiliate with the Southern Medical Association was held at the John Marshall Hotel, Richmond, Virginia, on November 10. Dr. Dean B. Cole, Richmond, Governor of the College for Virginia, presided and he introduced Dr. J. Winthrop Peabody, Washington, D. C., President of the College. Dr. Peabody spoke on College activities and he discussed the proposal for the organization of the Southern Chapter of the American College of Chest Physicians, to meet jointly with the Southern Medical Association. A motion was introduced and passed authorizing the President of the College to appoint a committee consisting of the Governors of the College in each of the states that affiliate with the Southern Medical Association to make plans for the organization of the Southern Chapter of the College.

1943 ANNUAL DUES

For the past five years, two members of the College have made it a practice to pay their annual dues at the end of the old year without waiting for the receipt of a statement. We appreciate the thoughtfulness of these two members, and we bring this item to the attention of the other members of the College because it means so much to the efficiency of the organization during wartime. Added burdens have been placed on the limited staff at the College offices and the prompt payment of annual dues helps to alleviate the mailing of additional requests and statements. *Please pay your 1943 dues promptly.*

NEW MEMBERS

Fellows

Dr. Carlos Arboleda Diaz, Bogota, Columbia
Dr. Fernando Domingo Gomez, Montevideo, Uruguay
Dr. Joseph H. Gerber, New York, New York
Dr. Germaine A. Guntzer, Fort Monmouth, Red Bank, New Jersey
Dr. Jose Rodriguez Pastor, Santurce, Puerto Rico
1st Lt. Raymond C. Ryan (MCR), Camp Chaffee, Fort Smith, Arkansas

Associate Fellows

Lt. Col. Aubrey L. Bradford (MC), Ancon, Canal Zone
Dr. Harry Brodsky, Salt Lake City, Utah
Dr. Robert J. Hanks, Waco, Texas
Maj. Bernard Lowenstein, Glendale, Arizona
Dr. Harry A. Nevel, Ketchikan, Alaska
Dr. Samuel G. Somers, Clinton, Oklahoma
Dr. William W. Stanbro, St. Louis, Missouri
Dr. Herman Weissman, Youngstown, Ohio

Associate Members

Dr. John G. Graham, Denver, Colorado

Associate Fellows Advanced to Fellowship

Lt. John Ben Jones (USNR), Ahwahnee, California

1943 COLLEGE DIRECTORY

The 1943 Directory of the American College of Chest Physicians will be mailed to each member of record on January 15th. Members who do not receive their copies of the directory, should notify the Executive Office of the College.

Dr. T. A. Woodson, Louisville, Kentucky, Fellow of the American College of Chest Physicians, read a paper entitled "Fluorography in a Case Finding Program" before the Jefferson (Kentucky) County Medical Society on September 21. Dr. Woodson's paper was accompanied by lantern slides.

At the regular monthly meeting of the Johnson (Iowa) County Medical Society, held November 4, Dr. Willard Van Hazel, Chicago, Illinois, Fellow of the American College of Chest Physicians, was guest speaker and he discussed the surgical aspects of bronchiectasis.

The winter meeting of the Iowa and Illinois Central District Medical Association was held December 10 at Davenport, Iowa. Dr. J. Arthur Myers, President-Elect of the American College of Chest Physicians, presented a paper entitled "The Differential Diagnosis of Chest Diseases."

COUNCIL ON PAN-AMERICAN AFFAIRS

The American College of Chest Physicians has been invited to participate in the Sixth Pan-American Congress on Tuberculosis, to be held at Havana, Cuba, in December of 1943. The invitation was extended by Dr. Juan J. Castillo, Fellow of the College and President of the Sixth Pan-American Congress on Tuberculosis.

The following physicians from Puerto Rico have been admitted as Fellows and Associate Members of the American College of Chest Physicians:

Fellows

Dr. Antonio Acosta-Velarde, Santurce
Dr. Miguel Alonso, Rio Piedras
Dr. Jose A. Amadeo, Aibonito
Dr. Miguel Antonio Zapata, Arecibo
Dr. Juan Avruza Perez, Santurce
Dr. Ramon T. Colon, Santurce
Dr. Eugenio Fernandez Garcia, Santurce
Dr. Luis Garcia de Quevedo, Rio Piedras
Dr. Manuel Guzman, Mayaguez
Dr. Angel M. Marchand, Santurce
Dr. Hector Rodolfo Marrero Otero, Caguas
Dr. Luis Roberto Perea, Mayaguez
Dr. Jose Rodriguez Pastor, Santurce
Dr. Manuel Santiago, Caguas
Dr. Jose Soto Ramos, Rio Piedras
Dr. Patrick Joseph Sullivan, Barranquitas
Dr. Alice Virginia Valcourt-Reinhardt, Fajardo
Dr. Federico Velazquez, Santurce
Dr. Rafael Velezquez, Bayamon

Associate Members

Dr. Jose Angel Franco Soto, Rio Piedras
Dr. August Stephen Tortorelli, Rio Piedras

Dr. J. Rodriguez Pastor, President of the Sociedad Puertorriquena de Tisiologos, has been appointed Regent of the College for Puerto Rico, and Dr. Jacob Smith, who has been Governor of the College for several years, will remain in this office. Under the leadership of these men, a Chapter of the College is planned to be organized in Puerto Rico.

The Cuban Chapter of the American College of Chest Physicians held a scientific meeting at the Instituto de Vias Respiratorias on October 26, 1942. The following program was presented:

"Importance of the Subcutaneous Test in Determining Tuberculin Sensitivity"—Dr. Rene G. Mendoza.

"Importance of Tuberculin Testing in the Adult"—Dr. Ricardo Sanchez Acosta.

"The Use of the Single Medium Dose Tuberculin Test in the Adult: Study in 5,220 Cases"—Dr. Francisco J. Menendez, Dr. Rafael Balltestero.

Dr. R. Sanchez Acosta, *Secretary*

BOOK REVIEWS

Artificial Pneumothorax in Pulmonary Tuberculosis. T. G. Heaton, M.B. The MacMillan Company of Canada, Lt. Toronto, Canada, 1941.

This book summarizes and evaluates the extensive literature on the subject of artificial pneumothorax. It incorporates the best of modern thought on a subject in which most of the literature appeared in the early decades of the present century and much of it in foreign periodicals. This exceptionally well written book makes the information available to many who might be interested in continuing the treatment of patients dismissed from sanatoria or hospitals.

Collapse of the diseased lung for the treatment of pulmonary tuberculosis has superseded the early conservative treatment of bed rest alone. Of all the collapse procedures, artificial pneumothorax has proved the most valuable and has become the method of election by the majority.

This book is not intended to cover the entire field of pulmonary tuberculosis and has avoided all reference to major thoracic surgery. It covers the subject of artificial pneumothorax completely, devoting the first four chapters to the philosophy on the subject. The subsequent seven chapters are devoted to the indications, contraindications, technique and complications. There is one chapter on extrapleural pneumothorax and one on oleothorax.

It is the reviewer's opinion that this book could well be used as a text by the novice. It will be of inestimable value as a guide in selecting the type of therapy to be instituted. The expert in the field may read it with profit and will undoubtedly desire to have it in his library.

James T. Speros

POSITIONS AVAILABLE

Physician to take over an active private practice in Pennsylvania city, population 100,000. Must be a qualified chest specialist, able to administer artificial pneumothorax. Part time work in a small tuberculosis sanatorium and a state pneumothorax clinic. Address: Box 102A, American College of Chest Physicians, 500 North Dearborn Street, Chicago, Illinois.

Assistant Physician. Some experience in diagnosis and treatment of tuberculosis. A physician able to work part time would be acceptable. Salary to start $250.00 per month. Send full particulars and photograph to Dr. Frank Walton Burge, 1930 Chestnut Street, Philadelphia, Pa.

Assistant Physician. Sanatorium located close to Chicago. A physician interested in a residency in tuberculosis would be considered. Moderate salary to start. For particulars, address: Box 101A, American College of Chest Physicians, 500 North Dearborn Street, Chicago, Illinois.

POSITIONS WANTED

Physician with more than 20 years of experience in diseases of the chest is interested in securing a position as Medical Superintendent of a small tuberculosis sanatorium. Experience, pneumothorax and thoracic surgery. At present resident physician at a sanatorium. Address: Box 200A, American College of Chest Physicians, 500 North Dearborn Street, Chicago, Illinois.

Physician with five years of experience in the specialty of tuberculosis. Medical and administrative supervision of an institution. Would like position as Medical Superintendent or assistant medical superintendent of a tuberculosis sanatorium. Address: Box 201A, American College of Chest Physicians, Chicago, Illinois.

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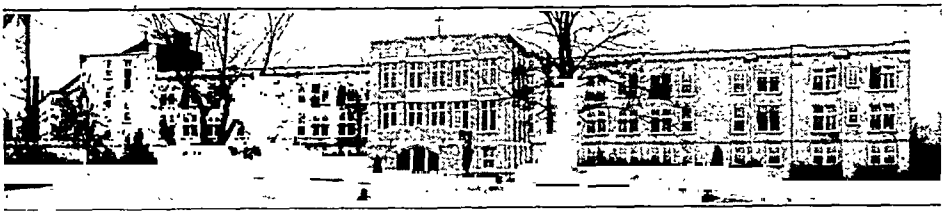
Chief of Staff and Thoracic Surgeon

ANDREW C. HENSKE, M.D.
Medical Director



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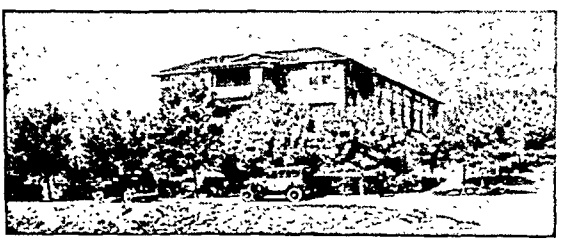

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Medical Director

T. F. CARBREY, M.D.
Associate Medical Director

SANATORIA DIRECTORY

The sanatoria listed in this section are among the finest private sanatoria in the United States. They are prepared to offer private, individual, specialized care to your patients.

●

For listings in the SANATORIA DIRECTORY write to the American College of Chest Physicians, 500 North Dearborn Street, Chicago, Illinois

California Sanatorium
Belmont, California

Chenik Hospital
Detroit, Michigan

Kula Sanatorium
Watakoa, Maui, T. H.

Laurel Beach Sanatorium
Seattle, Washington

Long Sanatorium
El Paso, Texas

Maryknoll Sanatorium
Monrovia, California

Mount Saint Rose Sanatorium
St. Louis, Missouri

Palmer Sanatorium
Springfield, Illinois

Portland Open Air Sanatorium
Milwaukee, Oregon

Pottenger Sanatorium & Clinic
Monrovia, California

Rocky Glen Sanatorium
McConnelsville, Ohio

St. Johns Sanitarium
Springfield, Illinois

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